The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. VIII. No. 211 JUNE 30, 1923 Prepaid Annual Subscription United Kingdom, $1.1.0; Abroad, $1.6.0.

Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to THE CHEMICAL AGE is 21s. per annum for the United Kingdom, and 26s. abroad. Cheques, Money Orders and Postal Orders should be made payable to Benn Brothers, Ltd.

Editorial and General Offices—8, Bouverie St., London, E.C.4.

Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (6 lines).

Increased Sulphate of Ammonia Output

THE Institution of Gas Engineers, which has been holding its annual meeting in Belfast this week, mainly provides fare which is of direct interest to the manufacturer of gas. On the other hand, the recovery and working up of the residuals from coal is almost purely a matter which concerns the chemist and the chemical engineer; and, as everyone associated with chemical industry knows, it is to the gasworks and coke-oven undertakings that we have to look for the staple raw products which form the starting point of a wonderful succession of processes. Of the more important compounds handled by the chemical industry in this country, sulphate of ammonia is always to the forefront, and in recent years it has been the subject of a good deal of discussion owing to the perfection of methods for producing ammonia synthetically. So far as the natural product is concerned, the menace of artificial nitrogen is not so alarming as it appeared at one time, for the reason that the cost of production by synthetic means does not hold out much hope for a price-cutting campaign, although, of course, if the supply eventually became so great that it exceeded demand, a general fall in prices must occur. The recovery of ammonia from coal and its subsequent conversion into the sulphate is, with sulphuric acid at its present level, an operation from which nothing very substantial in the way of profits accrues; but the aspect of the process would be considerably changed were some means of carbonisation to be discovered which permitted of a considerably greater yield of sulphate from each ton of coal. We can scarcely be so sanguine as to expect that we shall ever reclaim in saleable form the whole of the nitrogen which coal contains; but we do know from experience with the Mond system of gasification that some 60 lb. of sulphate of ammonia can be obtained per ton of coal in contrast with about 25 lb. which is considered a good yield in gasworks and coke-oven practice.

Fortunately, there seems to be good reason to expect that as the stereotyped form of carbonising plant in gasworks comes to the end of its useful life and is replaced, perhaps, by the modern vertical retort, the total output of ammonia from coal will be considerably augmented. Of the papers presented at the Belfast meeting there is one which is well worth the study of those associated with the chemical industry, for it describes how the normal yield of sulphate of ammonia has been practically doubled at the Coatbridge gasworks. Mr. George Braidwood, the engineer of the undertaking, found that his newly installed system of Glover-West vertical retorts was giving him some exceptional results in the way of ammonia, and he determined to undertake a series of practical experiments with the object of establishing the cause for such high yields. It is not necessary to enter into the technical details of the gasmaking methods Mr. Braidwood employed, but it will be sufficient to mention the fact that the maximum yield of ammonia resulted when 40 per cent. of steam was admitted to the coal retort, and that, in addition, the retort was operated under semi-low temperature conditions. Knowing this, it is not altogether difficult to account for the presence of the additional ammonia, for it is common knowledge that the latter is readily dissociated under certain high temperature conditions, and when its concentration in the gaseous mixture is moderately high. Moreover, it has been understood for some time that if the ammonia concentration is lowered by the presence of an inert or lean gas, the disintegrating influences have far less chance for attacking it. Thus, in the case of Coatbridge, we have an excess of water vapour accompanying the gas during its passage through the hot zone, and so minimising dissociation.

Herein evidently lies a method whereby coal can be made to yield twice its usual quota of sulphate of ammonia, but it will not do to jump too hastily to the

conclusion that in the near future we shall have an output of a million tons of sulphate a year in lieu of the present 500,000 tons, for in the first place the conditions which suit the production of ammonia do not seem to be commensurate with the most economical production of gas, and the gas engineer cannot be expected to sacrifice the welfare of his main product merely to satisfy the requirements of a subsidiary substance.

Production of Air-dried Peat

THE results of the investigations which the Fuel Research Board has been conducting respecting the production of air-dried peat are now published (H.M Stationery Office, pp. 146, 5s. 4d., post free). While the report contains a great amount of valuable information, nothing very remarkable in the way of commercial prospects is so far indicated. Although power driven plants for peat winning are now being manufactured in this country, the report deals only with air-dried peat. Mr. E. J. Duffy has carried out an investigation into the properties of air-dried peat and the factors which govern the rate of drying. Some hundred tons of peat, cut by hand, macerated by machine at Turrain and air-dried on the bog, were sent to the Fuel Research Station at East Greenwich, and experiments made on the carbonisation of this material in vertical retorts, and on its use as a fuel for steam raising. During 1920, Professor Purcell visited Canada in order to study the work of the Canadian Peat Committee on the mechanical winning of peat, and in 1921 and 1922 he visited Germany and Sweden for the purpose of studying the latest practices in those countries. The results of these investigations are all included in the present volume.

Peat, as it occurs in an undrained Irish bog, contains from 92 to 95 per cent. of moisture, and by drainage the moisture content can be reduced to between 88 and 91 per cent. As Sir George Beilby points out, however, peat cannot be usefully employed as a fuel until the moisture content is reduced to 25 to 30 per cent. The winning of peat on a small scale is a very old practice, but the problem of large scale production has many difficulties, as the facts disclosed in the report show. For example, for every separate ton of air-dried peat containing 25 per cent. moisture which is produced, 7½ tons of raw peat containing 90 per cent. moisture must be handled, even in the case of a drained bog. Further, even with the best qualities of peat, whose calorific value on an anhydrous basis is 10,000 B.Th.U. per lb., the 25 per cent. moist air-dried peat will have a net calorific value of not more than 7,220 B.Th.U. per lb. Taking the average net value of air-dried Irish peat at 6,900 B.Th.U. per lb., and industrial coal at 11,500 B.Th.U. per lb., net as fired, it follows that 1·67 tons of air-dried peat contains the same number of therms as a ton of coal. A ton of coal in bunkers occupies about 45 cubic ft., whereas a ton of air-dried machine-formed peat occupies about 90 to 95 cubic ft. Hence, for equal thermal effect with coal, 1⅔ times as much peat by weight must be transported. This will have 3½ times as much volume as coal. The result of such considerations is that, if peat is to compete with coal on a calorific basis, only the minimum of labour and the minimum of capital must be expended per ton produced. Further, if the peat has to be carried any considerable distance from the bog, the transport charges per therm may prove so excessive as to eliminate peat as a serious competitor with coal.

National Physical Laboratory

THE visitors who by invitation joined the General Board on Tuesday in the annual inspection of the National Physical Laboratory at Teddington obtained during the afternoon a good general idea of the scale on which research work goes on there, and of the methods followed in the different departments. The guests, who were received by Sir Charles Sherrington, President of the Royal Society and chairman of the Board, Sir Arthur Schuster, the vice-chairman, and Sir Joseph Petavel, the director, were drawn from branches of the Government service, from local authorities, from chemical, engineering and electrical firms, from university and technical colleges, and from societies for scientific and industrial research. There was no official programme, but the visitors followed their own inclinations or scientific interests, and in this pleasant unorganised fashion most of the departments received attention. Perhaps the most popular of these were the Froude tank, the largest in the world, we believe, where experimental work of the most practical kind is undertaken in ship-construction, design and seaworthiness under conditions as nearly as possible approaching those in the open sea, and the aerodynamics department with its wind tunnels and other appliances for determining problems of air-flow and their effects on aircraft construction and pilotage.

In addition to the Chemical and Aeronautical Chemistry Division, chemistry plays a large part in the work of most of the other departments. In the division named research is proceeding in the viscosity method for characterising deterioration of fabric, in the standardisation of samples of British steel for analytical purposes, and in the determination of oxygen in iron and iron-oxide alloys. Two sulphur standards (0·027 and 0·071 per cent.) and two carbon standards (0·10 and 0·65 per cent.) are at present available; a phosphorus standard will shortly be ready and a cast iron standard is in course of preparation. In the engineering and metallurgy departments constant demand is made on chemistry for help in the solution of problems under study. In the former a machine has been in use for some years for carrying out endurance tests on model asphalt roads. A plant has recently been installed and was on view for making tar and bituminous macadam. This is a full-sized commercial plant, made by the Ransome Machinery Co., Ltd. It consists of two units each weighing about 10 tons, in the first of which sand or other aggregate is heated to a temperature up to 600°F., and in the second unit the aggregate is mixed with bitumen. The plant under normal working conditions will dry, heat, screen, weigh and mix a batch of 12 cubic feet in 5 minutes, *i.e.*, 5 to 7 tons per hour. In the divisions devoted

to metrology, physics, electrotechnics, and other branches of science there was immensely more to see than the limited time available allowed. Research of the kind carried on at Teddington does not readily lend itself to advertisement, but the authorities are wise in occasionally opening their doors to the scientific public outside and in giving them a glimpse of their methods, apparatus, and organisation.

Chemists and Prohibition

THE intimate relations which exist between the United States Government and the chemical interests of the country is illustrated by the appointment of the Alcohol Trade Advisory Committee, whose special duty it will be to see that, in the enforcement of the Prohibition Act, the development of lawful industries which use alcohol as a raw material does not suffer. Mr. W. A. Sailer, president of the American Drug Manufacturers' Association, has been appointed chairman, and Dr. H. E. Howe, of Washington, editor of *Industrial and Engineering Chemistry*, secretary, and the other members are representative of most of the recognised branches of industrial and pharmaceutical chemistry. It is complained that since the enactment of the Prohibition Act the official conditions governing the manufacture, distribution, sale and use of alcohol for industrial purposes have seriously handicapped the chemical industry. One object of the committee is to cut out the "bootlegger," who, as we learn from an official communication, "masks his real purposes under the guise of a wholesale druggist or a manufacturer of flavouring extracts, and in this way obtains permits to sell alcohol to the drug trade and to physicians." This object, apparently, is to be attained by a stricter permit or licence system, under which *bona fide* users of industrial alcohol will be able to obtain the requisite supplies. The committee will act in an advisory capacity to the officials or departments charged with the enforcement of the Prohibition Act, and its representative character should be a valuable guarantee against illicit trade and a protection to the legitimate chemical manufacturer, to whom alcohol is an important raw material.

A Pleasant Annual Meeting

THE annual meeting this year at Cambridge of the Society of Chemical Industry appears to have resembled a very pleasant family party, with sufficient serious work to save it from the suspicion of being a pure holiday. It began amid the scholastic and scientific traditions of a great seat of learning, and it ended in the devout atmosphere of Ely Cathedral. If the contributions to science were few they were notable, and some may even live to be quoted. Dr. Charles Carpenter's absence was a real disappointment, but at least it enabled his friends to speak about his work with a freedom which his presence might have made difficult. At Liverpool next year the Society may meet under more practical but scarcely under more pleasant conditions.

Sulphate Export Trade

WHILE the home trade in sulphate of ammonia continues very quiet, the export demand remains remarkably steady, at prices appreciably higher than those fixed for home consumption. We hear, for example, of big dealings with Japan at £18 10s. per ton for best neutral quality, and from other markets there is a continuing demand. The relative positions as between this year and last are strikingly shown in figures which have just been published. During May of this year 21,500 tons of sulphate were exported, as compared with 4,700 tons in May of last year. This trade has no doubt been greatly helped by the diminished output in America, and though the situation there is reported to be improving, the effects have evidently not yet reached this country.

Points from Our News Pages

An article on "Recent Developments in the Manufacture of Superphosphate" appears, by Mr. A. Ogilvie (p. 690).

Mr. P. Parrish deals with "The History of Void Tower Sulphuric Acid Chamber" (p. 692).

A full account and report is given of the annual meeting of the Society of Chemical Industry at Cambridge, June 20–23 (p. 696).

The inquiry as to whether formaldehyde was to be included as a "fine chemical" under the Safeguarding Act was continued (p. 702).

Mr. C. S. Garland, M.P., has raised in the House of Commons the question of qualifications in recent appointments of public analysts (p. 703).

According to our London Market Report, business remained quiet with fair sales last week (p. 709).

Business in the Scottish chemical market remains quiet with a number of Continental inquiries but a tendency to lower prices (p. 712).

Books Received

PERFUMES AND COSMETICS. By William A. Poucher. London: Chapman and Hall, Ltd. Pp. 462. 21s.

THEORETICAL AND APPLIED COLLOID CHEMISTRY. By Dr. Wolfgang Ostwald. London: Chapman and Hall, Ltd. New York: John Wiley and Sons, Inc. Pp. 266. 12s. 6d.

PRINCIPLES OF CHEMICAL ENGINEERING. By William H. Walker, Warren K. Lewis, and William H. McAdams. London and New York: McGraw-Hill Book Co., Inc. Pp. 637. 25s.

ELEMENTARY PHYSICAL CHEMISTRY. By W. H. Barrett. London: Edward Arnold and Co. Pp. 247. 6s.

SUPPLEMENTARY NOTES ON GRAVIMETRIC ANALYSIS. By W. Lowson. London: Longmans, Green and Co. Pp. 58. 2s. 6d.

The Calendar

July 2	Royal Institution of Gt. Britain; General Meeting. 5 p.m.	Albermarle Street, London, W.1.
5	College of Technology, Manchester: Celebration of the Coming-of-age of the College Building. Conversazione at 7 p.m.	College of Technology, Manchester.

Recent Developments in the Manufacture of Superphosphate

By Alexander Ogilvie, A.M.I.Mech.E.

DURING the past ten years the manufacture of superphosphate has received the attention of some able minds, with the result that old time wasteful and inefficient rule of thumb methods have almost entirely disappeared.

The chemist and the engineer have been collaborating, and the processes now employed are not only more economical, but a better chemical product is assured. In regard to the grinding of the phosphate rock, the type of mill which has become standard is the ring and roller type. This mill has proved itself particularly suitable for the grinding of tri-calcic phosphate of lime, the hardness of which is so variable. Few materials of the same category vary so much as, say, the American and African phosphates. In this country, where all grades of rock are used, the manufacturer has now found a machine which will accommodate itself to the hardest as well as to the softest rock. These ring and roller mills are inexpensive to run in regard to both power and maintenance; they have no internal screens which are liable to give trouble, and hence require external screening or separating arrangements to extract the finished product.

The tendency in the industry to-day is towards a finer ground product, as less sulphuric acid is required for acidulating the rock, and the resultant superphosphate is dryer and contains less free acid.

This fine grinding varies in different works from 80 per cent. through 100-mesh to 95 per cent. through 100, and owing to initial moisture which the rock sometimes contains screening to this fineness is more or less troublesome.

The apparatus which has been developed to get over this difficulty and give a range of finenesses suitable for various requirements is the air separator.

This machine is not affected by ordinary moisture and hence there is no clogging. By simple adjustments the air current can be varied so that finenesses between wide limits may be obtained.

The accompanying illustration shows one of the latest type machines which is used in the industry.

FIG. 1.

In the manufacture of superphosphate many factors are involved, and a good product can only be produced by maintaining careful chemical control during all the operations.

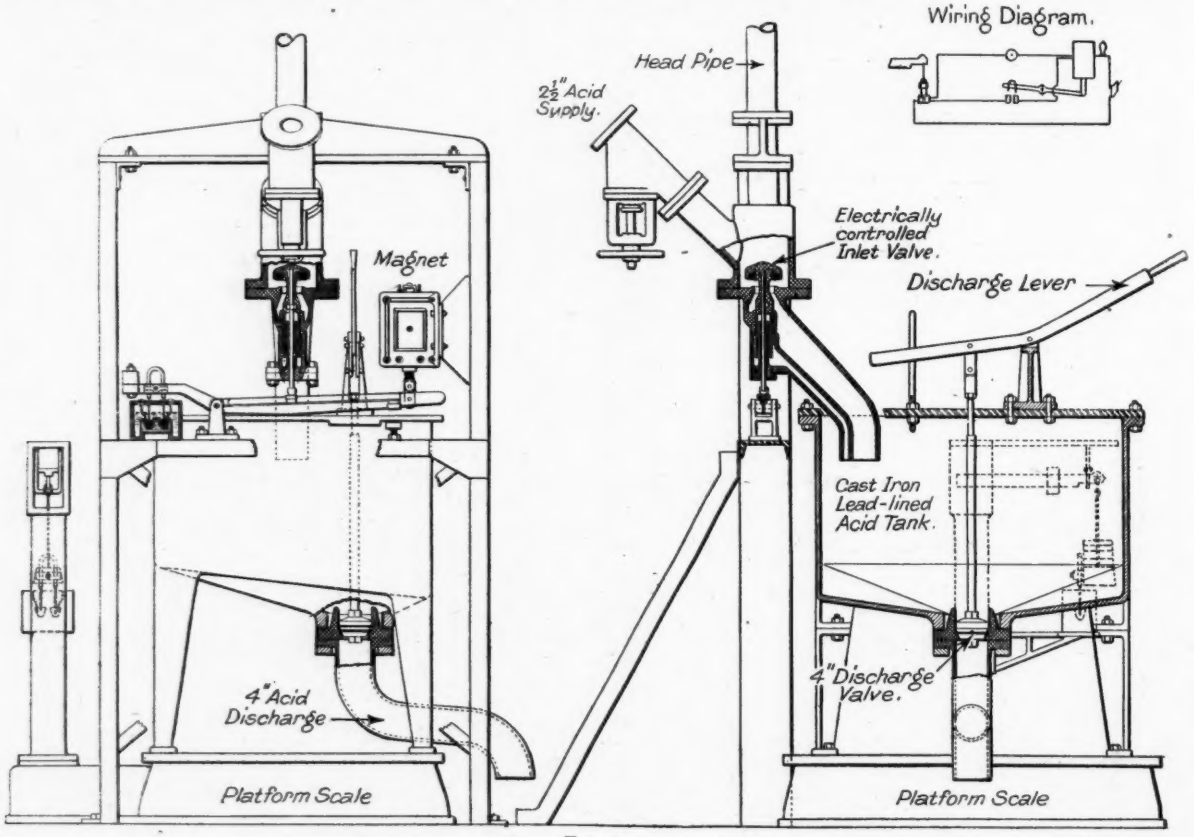

FIG. 2.

The tendency for some time now has been to weigh both phosphate and acid prior to mixing.

Various semi-automatic machines have been designed which ensure accurate weighings of both materials, so that the chemist is not at the mercy of the workmen guessing.

Sulphuric acid is not an easy liquid to weigh, on account of its corrosive action, and care has to be taken in designing such an apparatus.

The illustration (FIG. 2) shows one of the latest type machines which has proved successful and is now extensively used. The cut-off valve is controlled by an electric current and acts instantaneously. When the weighbeam tips the electric circuit is broken, demagnetising a coil which holds the valve open. It immediately drops into its seat, cutting off the flow of acid.

A machine of this type eliminates all chance inaccuracies in the weighing or measuring of the acid, which is an all-important point in the process of manufacture.

A good deal of attention has recently been given to the type of mixer best suited for this class of work. Vertical mixers have held the field for a long time and many people are prejudiced in their favour. Notwithstanding they possess many inherent faults.

Chemists are coming to the opinion that rapid and intimate mixing is most essential with a quick discharge into the den. A mixer has been designed with this particular aim in view, and future developments are likely to be along the same lines.

Horizontal mixing is always more thorough than vertical mixing, and this new type machine is based on this principle.

The mixer is a horizontal drum with a stirrer shaft passing through the centre. There is a long slot opening in the drum which forms the inlet and outlet opening.

The stirrers rotate at a moderate speed and meet the acid and phosphate as they enter the drum; as soon as the charge has run in, the barrel itself is rotated and when the opening comes below a certain point the contents are emptied out into the den.

Below is an illustration of one of these new type mixers.

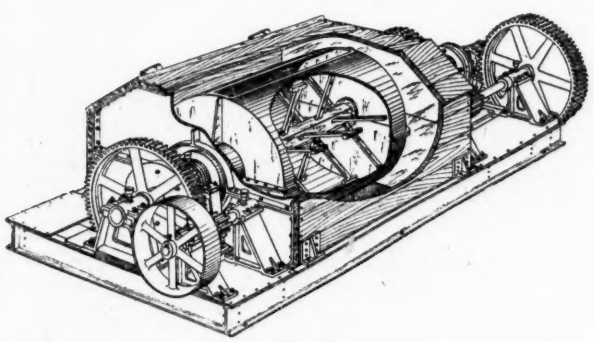

FIG. 3

Every fertiliser works of any size now possesses a mechanical den of one type or another. There are various designs to choose from, and all are a great advance over the old-fashioned hand dens.

The chief feature of all these mechanical dens is that the superphosphate is cut from the block in thin shavings and aerated more or less during the process of cutting.

The excavator which cuts finest and aerates most produces the best product. It is remarkable how these machines have revolutionised the industry during recent years, and the principle of fine cutting has been practically adopted throughout the industry on this side of the Atlantic.

In America, where large outputs approximating from 600 to 1,000 tons per day of superphosphate are obtained, excavating is still done with the grab crane, but the Americans are beginning to realise the mauling system is wrong in principle and does not yield a product comparable to the other in condition. They are now adopting the European system of fine cutting.

FIG. 4 gives an illustration of the system of fine cutting which almost speaks for itself.

These new methods have resulted in the production of a mono-calcic phosphate which matures after a very short time in storage.

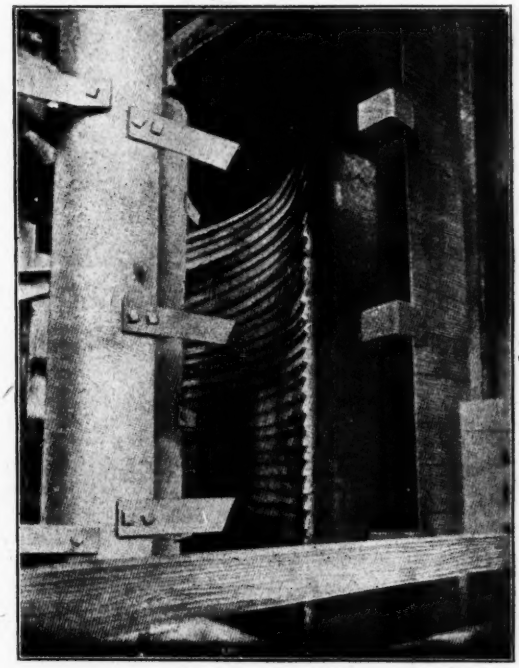

FIG. 4.

Here is a typical instance of how quickly it matures:

	Moisture.	Available. P_2O_5	Insol. P_2O_5	Total. P_2O_5	Free acid as H_2SO_4.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Analysis taken at time of cutting out	13·34	16·49	1·35	17·84	3·80
Analysis after 30 days.....	12·40	17·27	·57	17·84	2·31

In regard to the costs of operating a modern plant such as has been described above, three men will operate a plant producing 100 tons of superphosphate per day, which averages for labour 2d. to 3d. per ton. This includes grinding, mixing, excavating and depositing in store.

The power taken is approximately 6 kilowatt hours per ton for all operations and at a price of, say, 2d. per unit, costs 1s. per ton for power.

After the superphosphate is matured, it is mixed with various other fertiliser ingredients to make up compound manures. This work is still in many instances done by hand with very indifferent results.

Accurate analysis can only be depended on where a modern mixing plant is in operation, and force of circumstances is gradually compelling the manufacturers to discard the old-fashioned method of hand mixing.

An up-to-date plant comprises a batch mixer with vibrating screen and pulveriser to deal with the oversize.

A batch of approximately 1 ton is introduced into the mixer after being screened and any tailings reduced; and after being thoroughly mixed is discharged into bagging hoppers, from which it is bagged and weighed and generally loaded into wagons direct.

One of these modern equipments will mix and bag approximately 30 tons of compound fertiliser per hour.

Recent developments, therefore, have not only been directed to improving the quality of the product, but also towards reducing the working costs.

It will further be seen from the foregoing that the modern fertiliser plant of to-day, instead of operating by old rule of thumb methods, is gradually being run on highly scentific lines requiring the services of both the analytical chemist and the chemical engineer.

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The History of Void Tower Sulphuric Acid Chambers

By P. Parrish, A.I.C.

THE history of the introduction of void tower chambers to the United Kingdom is not generally known. Up to 1910, the construction of sulphuric acid plants in this country had largely followed certain definite and well-established lines, departure from which was contemplated with appreciable misgiving.

About this time technicians became obsessed with the idea of the intensive operation of sulphuric acid installations. The hitherto accepted basis of approximately 16 cubic feet of chamber space per pound of sulphur per twenty-four hours was regarded as unnecessarily high, and attempts were made to increase production with existing plants. Information began to be disseminated that "X" works were operating with a chamber capacity of 12 cubic feet; a few months later

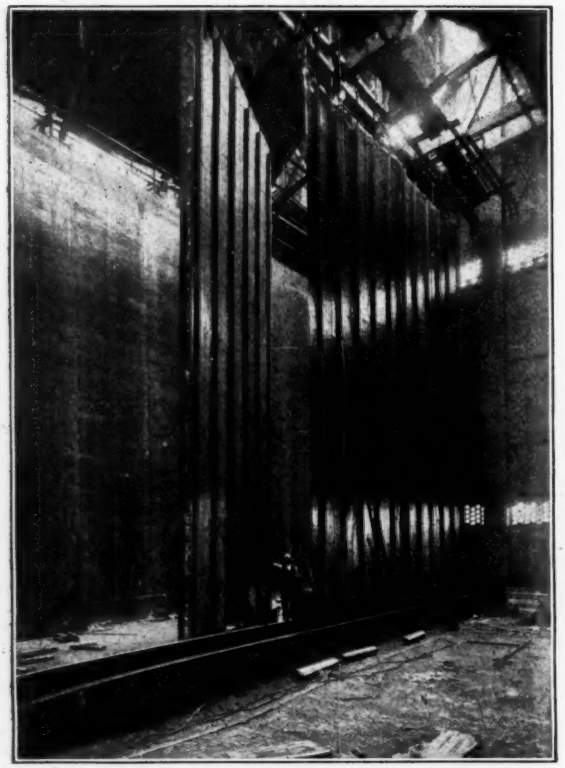


FIG. 1.—View of Moritz Chamber System.

the news gained currency that "Y" factory had succeeded in working their plant satisfactorily with a chamber space of 10 cubic feet, and no sooner had credence been given to this report than one was apprised that "Z" works were producing sulphuric acid normally on a basis of 8 cubic feet of chamber space.

Needless to say, in all these cases, very little information was vouchsafed beyond the bare fact that there had been a distinct increase of production. Whether the nitrate of soda or nitric acid consumption had suffered, whether the regularity of operation had been disturbed, thus involving extra chemical supervision, or whether there was reason to suspect increased action on the leadwork of the chambers, were factors, concerning which the "progressives" were peculiarly reticent.

Visits to some of the works where the acme of intensivity was reputed to have been reached soon revealed that these reports had lost less of a sensational element than veracity in their transmission.

Production Increased

That the productive capacity of many plants had been increased was undoubted, but certainly not to the extent represented. But it was not denied that the increase had been attained by a sacrifice of efficiency in nitrate of soda or nitric acid consumption, and of steadiness and regularity of operation. Apart from these aspects, doubt existed as to the effect of intensive operation on the life of the plants.

This was about the autumn of 1911. It was clear, then, that a definite era in the evolution of chamber plant had been reached, and that a rational examination of the whole question of intensive working was imperative.

Investigations disclosed, *inter alia*, that the best results were not likely to be achieved unless the various parts constituting the integral plant were carefully designed and delicately proportioned, and modifications were made in the construction of the chambers for aiding the rapid dissipation of the heat of reaction, in order to ensure intensive working without risk of the normal life of the lead.

One naturally turned to Continental countries to ascertain what progress had been made there in this connection. True, Niedenführ had tried the operation of a second Glover tower with suitable drafting arrangements with a fair degree of success as a means of increasing the productive capacity of the ordinary chamber plant; equally true it was that the Erste Oesterreichische Sodafabrik at Hurschau were creating records with the Opl tower system, but this involved packed towers.

The Moritz System

After an inspection of the Benker and Millberg system of modified chamber design, as erected at the Usine de Com-

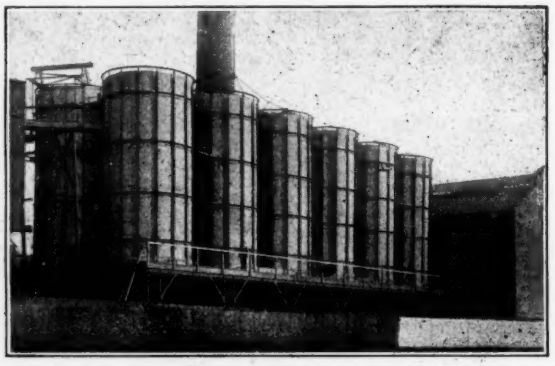


FIG. 2.—An Installation of 12 Tower Chambers.

pagnie Frappier at Vierzon, it was to the Moritz system (figure 1)—which provided for the chambers being supported by a strong skeleton of steelwork, where the suspension of the leadwork by lead-covered iron flats was practised, where the chamber top took the form of a suspended dome, and where the design contemplated the essential idea that rapidity of sulphuric acid formation was not so much due to the cubical capacity afforded as to the effective surface area of the lead walls rendered available for heat dispersion, that attention was directed.

In January, 1912, Mr. J. H. Brown (now managing director of Messrs. Simon-Carves, Ltd.), and the writer made an inspection of several Moritz plants in France and Belgium, and were peculiarly impressed not only with the marked improvement of chamber construction, but with the singularly satisfactory working results secured. It was appreciated that the Moritz system combined all the elements for intensive operation along with satisfactory protection of the leadwork.

Subsequent consideration revealed that a possible deterrent to the adoption of the Moritz chamber system in this country would be the factor of initial capital expenditure, which represented about 15 per cent. more than the outlay on plant having the usual wooden structure.

Development in England

Whilst the prospect of introducing the Moritz system of chamber plant to this country was not regarded as impossible, it was felt that a cheaper form of arrangement,

which would serve to combine most of the features of the Moritz chamber, would be a decided advantage.

Eventually a steel supported cylindrical void chamber was designed, the first two of which were erected in Dewsbury by the writer at the early part of 1913.

These chambers were 32 ft. 6 in. high by 14 ft. 9 in. diameter (Continental measurements—10 metres by 4·5 metres), supported by sixteen vertical lead wings about 5 in. wide, placed at centres of 22½ degrees, and burnt to the sheets constituting the circular chamber. The wings were fixed between the vertical steel angles forming the skeleton framework, and suitable flats, which were bolted at 8 in. centres. The tops of the chambers had attached to them by lead straps a series of concentric rings, which in turn were held by galvanised wire to rolled steel joists spanning the top angle iron ring of the circular chambers.

The tension of the iron wire was capable of easy adjustment. Figure 4 makes clear the method of support of the chamber tops.

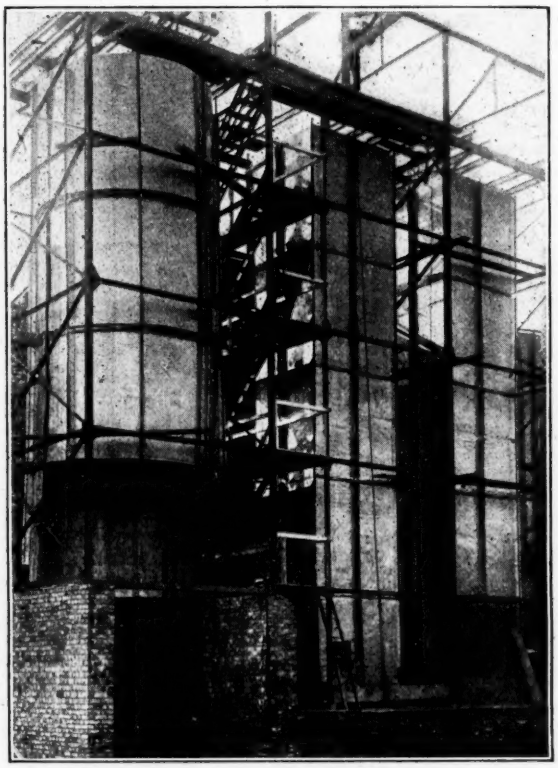


FIG. 3.—Glover and Gay Lussac Towers in Course of Erection.

It was found that if the chemical sheet lead forming the chamber was of 7 lb. strength, the weight of lead per chamber would be approximately 7 tons, the steelwork representing about 55 cwt.

Obviously, no data existed as to the capacity of the void cylindrical towers in question, as at the time of the design—about the middle of 1912—no such chambers had ever been operated.

Moritz had found, with his rectangular chambers, that it was possible to produce 20 kilograms of 50° Be. acid (1·53 specific gravity—62·5 per cent. H_2SO_4) per square metre of lead wall exposed, which represented 13·7 kilos of H_2SO_4 per cubic metre. In face of the fact that the Moritz rectangular chambers were housed, as contrasted with the exposed character of the tower chambers, and having regard to a mass of other data which had been collated, the conclusion was reached that it would be reasonable to count on the production of 12 kilograms of sulphuric acid per cubic metre, which, on the English basis, would represent approximately 4 cubic feet of chamber space per pound of sulphur per twenty-four hours.

Manifestly, this constituted a marked advance on anything hitherto recorded; indeed, so important that at this juncture it was prudent, prior to inviting the confidence of chemical manufacturers, that a definite determination should be made as to the productive capabilities of these towers.

Two towers were first installed with a view to determining the ease with which such chambers could be erected, and their stability under varying conditions of weather and wind pressure. It was appreciated that little definite information could be culled from any working results obtained, as their capacity represented a small percentage of the integral unit of which they formed a part.

The production of acid in the two chambers in question, whilst relatively high, fluctuated appreciably in point of strength as collected at the drips. The specific gravity of such acid was consistently lower than that to which one was accustomed when operating the old system, and it was evident that there were factors which clearly needed to be investigated.

A Six-Tower Installation

It was decided, therefore, to erect a complete unit of plant, comprising six tower chambers, Glover and Gay Lussac towers, in order to try out this system on a practical scale.

Unfortunately, delay occurred in the completion of this installation, but other units of plant (as shewn in figures 2, 3 and 4), were being erected in other parts of the country. Simultaneously, Moritz was responsible for the introduction of this system to a works at Nevers, in France.

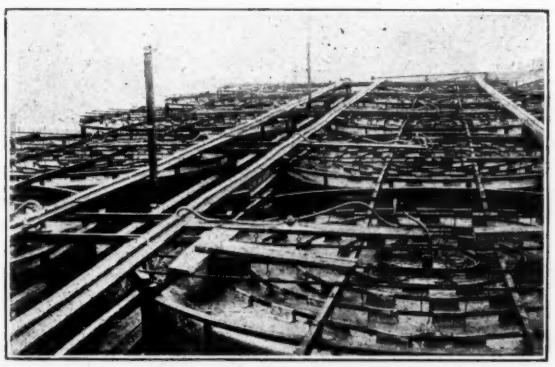


FIG. 4.—Tops of 12 Tower Chambers.

Figure 5 shows the disposition and approximate dimensions of the Nevers plant, and below is a tabulation of average working results obtained at this installation during the first six months of its operation :—

AVERAGE RESULTS AND DATA OF THE OPERATION OF THE PLANT AT NEVERS.

Average Temperatures of Chambers.

No.	1	2	3	4	5	6	7	8	9	10
°C.	80	79	67	68	60	61	42	43	33	22

9·4 short tons of Pyrites burned per day, 48 per cent. sulphur.

Strength of Acid.

	sp. gr.
No. 1 chamber—48° Be.	(1·498)
No. 2 chamber—49° Be.	(1·515)
Mean of all chambers—53° Be	(1·58)

Plant worked exclusively with water sprays :—
Chambers 1 to 6—operated under pressure.
Chambers 7 to 8—in equilibrium.
Chambers 9 and 10—under slightly reduced pressure.

Production, equivalent to 8·3 kilos of H_2SO_4 per M^3, representing 5·9 cubic feet of chamber space per pound of sulphur.

General Conclusions

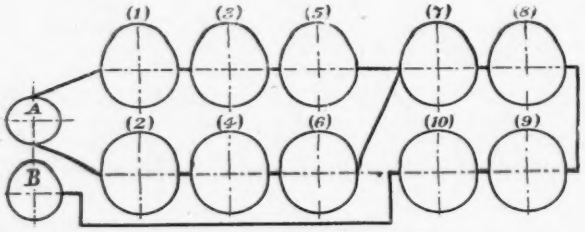
A Continental contemporary, writing to the author on December 31, 1913, said :—

" En vérifiant les calculs je trouve qu'en brûlant 8 tonnes de pyrite et en marchent avec six tours de 4·5 m. et 10 m. de haut, ces dernièrs devraient produire environ 12·5 kilos. H_2SO_4 par M^3, ce qui est exagéré.

" Je considerai qu'on ne doit pas depasser 9 kilos. H_2SO_4."

About this time an opportunity was afforded of working the Berwick plant under varying conditions, and the conclusion that the author reached was that seven to eight cubic feet of chamber space per pound of sulphur per twenty-four hours was the maximum at which the plant could be operated efficiently, from the points of view of yield, nitrate of soda consumption, and suitable strength of the acid produced, except extraordinarily large Gay Lussacs were provided.

Whether better results could have been attained, had the connections been taken from the top of the one chamber and brought almost to the foot of the adjoining chamber certainly



A.....Glover Tower. Height 9m. Dia. 3·25m.
B.....Gay Lussac Tower. Height, 12·25m. Dia. 3·35m.
1 to 10.....Void Tower Chambers. Height, 10m. Dia. 4·5m.

FIG. 5.—Disposition of the Moritz Tower Chamber Plant at Nevers.

appeared probable, but it was difficult to eradicate the original concept as to the movements of the gases in these chambers. Rightly or wrongly, the idea had been formed that during the working of these void towers there was a core of hot gas, which was gradually dispersing ever-increasing concentric circles of gases, until these came into contact with the cooling influence of the circular walls of the chambers. But the questions of velocity and turbulency of motion were never definitely determined, though there was ground for the belief that a distinct improvement would have followed an alteration in the arrangement of the connections, if for no other reason than that these connections would have ensured adequate mixing of the gases.

Of course, in a brief historical survey of this character it is impossible to discuss all the interesting physico-chemical aspects which arise, several of which have not even yet been sufficiently explored.

It only remains to say that the void tower chambers of the type illustrated in this article were undoubtedly the precursor of the Mills-Packard water-cooled chamber, which, in the writer's view, constitutes a distinct advance on the cylindrical void chamber, not only by reason of its greater size, but on account of the tolerably sound principle of water cooling, and the rational way in which the connections are arranged.

It is important that the reader should not confuse the void tower chamber under discussion with the Moritz system of rectangular housed chambers, which, generally speaking, have given very satisfactory results.

The Constitution of the Atom

SIR ERNEST RUTHERFORD, speaking at the Royal Institution on " Atomic Projectiles and Their Properties," on Saturday, June 16, described some experiments which proved that hydrogen was present as such in the atoms of the elements boron, nitrogen, fluorine, sodium, aluminium, and phosphorus. He had succeeded by using the high-speed alpha rays of radium " C " in knocking hydrogen out of all those elements, in which it was probably present as a " satellite " of the atomic nucleus. He had hopes that in the near future photographs would be obtained of atoms in collision, and being disintegrated. In dealing with the problem of breaking up atoms he had observed effects which seemed to indicate that under the conditions obtaining in an atom, the ordinary laws of force did not operate, and that particles which normally repelled each other exercised mutual attraction when brought close enough. The study of atomic collisions might very well lead to new and important discoveries.

The Chemistry of the Rare Earths.

A Lecture at the Mining Exhibition.

ONE of the papers given at the Mining Exhibition at the Agricultural Hall, on June 14, dealt with the subject of the Rare Earths.

The author of the paper, Mr. Edmund White (Hopkin and Williams (Travancore), Ltd.), stated that the rare earths comprised a group of elements allied in many ways to the alkaline earths, and were so named because at the time of their discovery they were only known as constituents of a few minerals occurring in small deposits and in very few localities. Within the last 40 or 50 years large deposits of some of these minerals—notably monazite—had been discovered, and certain of these rare earths were obtained in quantities for which no adequate outlet has yet been discovered. The most valuable of the rare earths is thoria, but in monazite, which contains 5–10 per cent. thorium oxide it is associated with 60 per cent. of the cerite group of oxides consisting chiefly of the oxides of cerium, lanthanum, praesodymium, neodymium, and a small proportion of yttrium.

Samples of the minerals were exhibited, the following being mentioned as the most important :—

1. Monazite sand from Brazil ..... 6–7% ThO_2
   Monazite sand from Travancore..... 9–7% ThO_2
   Monazite sand crystallised South Africa .... 1% ThO_2
2. Thorianite. Ceylon in cubical crystals containing 70% ThO_2, with 5–10% U_3O_8.
3. Thorite. Ceylon in pebbles containing 56% ThO_2 as silicate.

In thorianite and thorite the thorium was associated with varying proportions of uranium, and in some specimens the uranium predominated and thorium occurred in much smaller proportions.

Monazite was nearly always found as sand associated with quartz, garnet, zircon, ilmenite, and small quantities of many other minerals which had apparently resulted from the disintegration of primary minerals. The disintegrated products had been carried down by rain and conveyed by rivers to the sea where, by the action of tides and waves, a partial concentration had been produced. The sp. gr. of the minerals mentioned above in round number, was as follows :—Monazite, 5·0 ; zircon, 4·7 ; ilmenite, 4·5 ; garnet, 4·0 ; quartz, 2·6. In certain sea-shore deposits patches occur where monazite constitutes even 80 per cent. of the sands.

In Travancore and Brazil, where the largest deposits occurred, the hinterland behind the present high water level was sandy and contained monazite. Obviously this had been deposited by the sea, which had since receded. The company with which the author was associated, Hopkin and Williams (Travancore), Ltd., are at present working in the hinterland, and the operations were explained by means of a series of lantern slides. Monazite occurred in roundish translucent yellow grains and could be easily distinguished and the percentage approximately estimated by means of a hand lens. Its occurrence was limited to the depth of a few feet below the surface, and the simple means was adopted for the selection of a suitable position for working the deposit, of digging a hole to expose the various strata which were examined for the occurrence of monazite. A suitable position having been thus selected, the sand was cut away for removal to the factory so long as paying quantities were found. The raw sand was then subjected to a simple sluicing treatment which removed soil and a large proportion of the quartz, the resulting washed sand being composed chiefly of ilmenite with 10-15 per cent. of monazite and zircon with varying proportions of quartz, garnet, and other minerals in small proportions. The washed sand was then dried in a barbicue in the sun in favourable weather, or on iron plates in a furnace in wet weather. It was then sifted to remove all the coarse grains, none of which were monazite, and then passed through an electromagnetic separator. The final products were collected in four fractions—monazite, zircon, ilmenite and quartz. By far the largest fraction was ilmenite, and an illustration was shown of a dump of about 30,000 tons. Zircon occurred in quantities about equal to monazite, and another slide showed the accumulation of zircon which was awaiting an outlet for its employment. Other slides gave a general view of the factory, which employed several hundred people when in full operation.

Use in Gas Mantles

Monazite was essentially a phosphate of the rare earths, and this mineral had in recent years constituted the source of thorium for the manufacture of incandescent gas mantles, but it was pointed out that it contained much larger proportions of the other rare earths—cerium, lanthanum, neo- and praseodymium. Many attempts had been made with some success to find a use for these rare earths, but in the manufacture of the thorium much larger quantities were obtained than could at present be utilised. The separation of the rare earth salts in a pure condition involved long and difficult operations on account of the similarity in their chemical properties and the solubility of their salts. The total rare earths minus thorium were, however, available at a comparatively cheap price. The mixed metals obtained by the electrolysis of the chlorides, when alloyed with iron, constituted the sparkling metal so familiar as pipe-lighters. The oxides, hydrates and carbonates were also used in the manufacture of Crookes' glass for spectacles, such glass cutting out certain undesirable rays in light. The resinates and similar compounds were used as siccatives in varnishes and paints. Many experiments had been made with a view to discovering useful alloys with cerium metals, but not much progress has been yet reported. Experimental work has also been carried out to utilise the rare earths for porcelain and glass colouring, enamels, polishing materials, mordants in dyeing, tanning, photography, as catalysts, flash-light powder, and so on. None of these outlets, however, had developed sufficiently to become important factors in the utilisation if the surplus rare earths. The author expressed himself as more hopeful of developments in the direction of metallurgical use in the form of some alloy which might be found to possess physical properties of value for some special purpose in manufacture or the arts.

Nature's Lessons for the Chemist

Examples of Recent Research Successes

Discussing the tendency among chemists to study the chemical processes at work in nature, Dr. Horwood Tucker, of Glasgow University, states that of late years there has been a growing school of activity, which has set itself to find out, first, how Nature works, and then, faithfully reproducing the true state of affairs, endeavour to imitate her mode of action. It entails a tremendous amount of research, because so many disturbing factors have to be taken account of in a natural process. One reaction never proceeds to the exclusion of secondary changes. With all these contending difficulties tangible progress has been made. An outstanding experiment on these lines was performed by Professor R. Robinson in a synthesis of atropine, an alkaloid which causes dilation of the pupil of the eye, and is accordingly universally used in the examination and treatment of diseases of that organ. During the course of the preparation of atropine an intermediate product had been obtained in the laboratory by an extremely intricate and difficult series of steps. The work was a classical example of most complicated synthetic research. Professor Robinson showed that by imitating temperature conditions and reacting factors prevailing in the natural environment under which atropine is produced in the plant (deadly nightshade) the intermediate required in the preparation of this valuable alkaloid could be simply prepared in one step.

Similarly the study of the formation of naturally occurring sugar gave productive results. Plants live on carbon dioxide, and it was long ago shown that this gas combined with water in presence of the green colouring matter of the leaf and sunshine to form the substance, contained in solution in the disinfectant "formalin," viz., formaldehyde. It was further shown that in presence of lime this substance gives a sugar. In this way the natural cycle of changes was grasped, and it was not long before large quantities of sugar were synthesised from carbon dioxide and water in presence of inorganic salts under the action of ultra-violet light. Thus, again, the true imitator was not deceived.

Discovery of Insulin

It is well known that a diabetic subject is unable to assimilate the sugar required for sustenance and excretes it unchanged. Up to a short time ago it was believed that the sugar glucose, taken into the system, was used up directly as an energy food. But it has now been established beyond doubt that before glucose can be utilised as a food it must be first converted into a very active form called gamma-glucose. In the healthy human body this is readily brought about, and the gamma-glucose is then taken up by the blood and at once assimilated. British chemists have put forward evidence that ordinary glucose is converted in the intestine into gamma-glucose. It is therefore suggested that the sugar present in the blood of patients suffering from diabetes is the ordinary inactive glucose, and that the failure of the organism to utilise sugar in this disease is due to the absence or inactivity of a substance which in the normal subject converts the ordinary type of sugar into the active gamma-glucose form. This activating substance occurs in an internal secretion of the pancreas, and is evidently essential for the utilisation of sugar.

Having now, by careful study of Nature and her caprices, obtained our ideas of the *modus operandi*, we can set out to imitate her. This has been done with extraordinary success by two young Canadians—Banting and Best, of Toronto. They found it was possible to extract the active substance from normal ox pancreas. The material thus procured proved so powerful in its action on dogs that it was tried in a severe case of diabetes in a boy of 14. It effected a 25 per cent. reduction of the blood-sugar. To the active substance present in this extract the discoverers gave the name "insulin." The importance of this painstaking and thorough piece of research in relation to the clinical treatment of diabetes and in the purely scientific study of sugar consumption in the animal body cannot be overestimated, and serves to show very clearly, not that "imitation is the sincerest flattery," but that sincere imitation of Nature is the royal road to success.

A New Oil Meter

Description of the Kennedy Apparatus

There has just been placed on the market by Glenfield and Kennedy, Ltd., Kilmarnock, a new pressure meter for the measurement of oil, especially in connection with oil tanker and oil storage plant generally. The new meter which measures oil, of almost any viscosity, is an adaptation of the "Kennedy" hot water pressure meter, and is of the displacement type. It consists essentially of a vertical cast iron measuring cylinder fitted with a metallic piston and cast iron cover. Each complete stroke of the piston, actuated by the pressure of the oil from the pump used in causing the oil to travel corresponds to the displacement of a definite and measured volume of oil. The mechanism of the meter is double acting and automatically reversing, and each stroke of the piston is recorded in terms of gallons of oil by means of a train of wheels or a series of graduated dials.

The piston is of cast iron, with two special gunmetal piston rings, and the cylinder is machined out internally so as to give a smooth bore and form a perfectly tight joint. To the end of the piston rod, passing through a stuffing box in the cover is attached a rack which engages in a pinion, and operates both the recording mechanism and also the reversing arrangement, which automatically ensures that the meter is double-acting and the flow of oil is alternately under and over the piston, as required, at the end of the stroke. It should be noted that the measuring mechanism is continuous in action, that is to say, it does not measure merely the number of separate strokes of the piston, but the continuous travel, a much more accurate arrangement.

The meter is made in standard sizes of 3 to 8 in. bore. A 6 in. meter is a useful unit for oil tanker work, and handles normally 16,000 gallons of oil per hour, with an overload capacity of 25,000 gallons, and the nett weight is 2,966 lb., or 3,080 lb. with packing, the latter being a case 66 in. by 39½ in. by 37⅞ in. The meter is tested to 500lb. pressure, and if provided with a gunmetal cylinder liner can also be used for hot water under pressure, or for liquids like petrol, benzol, and alcohol. The loss of pressure on the pump circuit is very small, and depends of course on the viscosity of the oil. When using water at 60° F. the loss for a 6 in. meter at the normal duty of 16,000 gallons per hour is only 2½ lb. per square inch, and with an ordinary crude petroleum fuel oil at 60° F., the figure is about 8 lb. per square inch. Very thick viscous oils, almost like greases, can also be measured with perfect accuracy, provided the necessary extra power in the pump is available, equivalent to say 50 to 100 lb. per square inch.

Snapshots at Cambridge

The Society of Chemical Industry

Annual Meeting at Cambridge

The Annual Meeting of the Society of Chemical Industry was held at Cambridge from June 20 to 23, under the Presidency of Dr. E. F. Armstrong, F.R.S. A report of the President's address was published last week, and the subsequent proceedings are reported below.

Notes and Impressions

[From our Special Correspondent]

THE Society of Chemical Industry this year, in choosing Cambridge as the place of their annual meeting, made something of an innovation. In previous years it was the practice to hold the meeting in some large industrial centre such as Sheffield or Glasgow, and to devote a considerable amount of time to lectures and papers as well as visits to works. This year the time spent on this side has been much less, there being only two papers read, and, as was desirable in a place of such general interest and historic importance as Cambridge, a large proportion of the time was given up to sight-seeing and entertainment. The weather, which can only be relied on to be unreliable, after starting the week with the usual cold and rain which has been so persistent, on Thursday underwent a drastic change, becoming warm and finally even hot and sunny, a fact which contributed largely to the success of the conference, especially as far as the ladies were concerned, who were of course not particularly interested in the proceedings which were the ostensible cause of the function.

At the annual meeting proper an innovation was made in the institution of honorary members, and this distinction was conferred on five foreign chemists or chemical industrialists. One of the advantages of choosing the same venue for the congress as the International Union of Pure and Applied Chemistry (the meetings of which were held earlier in the week) was that two of the recipients of this new honour were present and able to reply suitably. These were M. Paul Kestner, whose chemical engineering work is well known, and Prince Ginori Conti, a distinguished Italian who, we were informed, among other activities is chairman of a company which is interested in the production of power and the development of electro-chemical industry from Italy's natural resources in volcanic steam.

The only question in the Society's annual report that raised any discussion was that of the revenue from advertisements in the *Journal*, which was considerably less than last year. It was stated, however, that the committee had taken the matter in hand some months ago. All other questions of policy were dealt with with a marked unanimity, and this year there was no uncertainty as to the place for next year's meetings, it being decided to hold them at Liverpool.

Dr. Armstrong's address formed the central feature of the first day's meeting. It was mainly a review of the present position of the British chemical industry, and was published in THE CHEMICAL AGE last week. It contained one suggestion, however, which attracted considerable interest, namely, the proposal for co-ordinating the work of a multiplicity of chemical societies in some form of federation. This was a constructive proposal which, if carried out, would fill a want. There was an attendance of over a hundred at the meeting, higher than was originally anticipated.

It was unfortunate that Dr. Carpenter, the recipient of the Society's Medal, was unable to be present and read his address himself, but what looked like causing an unpleasant hitch in the regularity of the proceedings was averted by Professor Pope reading an abstract of the paper, which was a remarkable feat in itself, as the abstract was excellent and the paper had only been in his hands a little more than an hour. The main theme of Dr. Carpenter's address was that gas-making was essentially a chemical process, the development of which was now being somewhat hindered by the lack of definite knowledge of the chemical nature of coal and the processes accompanying its destructive decomposition. The absence of Dr. Carpenter permitted a freer reference to his work, and the tributes paid to it, though generous, did not exceed what was due. Mr. Woolcock, in particular, emphasised Dr. Carpenter's part in the formation of the Association of British Chemical Manufacturers.

Instead of the more conventional visits to works, parties were conducted by chemical research workers, who acted throughout as stewards, round the chemical laboratories. These are large and capable of containing 900 students, though in somewhat confined space, and a large part has been only recently opened. This new section contains many modern improvements, but some members of the Society considered that, taken as a whole, the laboratories were inferior to those to be found in certain other centres which are less noted for their chemical work. Cambridge, however, is the home of pure chemistry, and pure chemistry necessarily does not need very elaborate equipment. Dr. Aston, in his lecture on "Isotopes," showed that Cambridge is maintaining its reputation as the home of what we may call "chemical physics." Dr. Aston is working in the same laboratory and carrying on the same work in the investigation of fundamental (or as some might say slightingly, theoretical) principles. In this laboratory (which is known as the Cavendish laboratory, in honour of one who was among the founders of chemistry as well as a great experimental physicist) such men as Clerk Maxwell, Rayleigh and J. J. Thompson have worked.

The various social engagements ranged from the official welcome by the Vice-Chancellor of the University and the Mayor of Cambridge to the ball held in the Guildhall, and the garden party in the grounds of Sidney Sussex College. The mayor, in his official welcome before the annual meeting, caused considerable amusement by drawing attention to the fact that the conference coincided with the opening of the Midsummer Fair, so that members would be able to visit the swings and roundabouts there and gratify any desires for shying coconuts. We are not aware whether anyone accepted this invitation.

The Vice-Chancellor and his wife (Dr. and Mrs. E. C. Pearce) held a reception on Thursday afternoon in one of the galleries of the Fitzwilliam Museum, where many took the opportunity of examining the unique collection of pictures and *objets d'art* that finds a home there.

The President and Mrs. Armstrong held a reception on Thursday evening in the Guildhall followed by a dance, at which many notable Cambridge residents connected with the University were present. This dance was one of the most successful events at the congress, as the local organisers arranged that sufficient ladies were invited to make up for the excess of male members among the visitors, making a total of nearly 300 present. The two factors essential for the enjoyment of the dancers, the band and the floor, were both pronounced excellent, and in the spacious setting of the Cambridge Guildhall the whole effect was brilliant. The organisers are to be heartily congratulated on the success of this function.

It may perhaps be explained that the reason for the holding of the garden party at Sidney Sussex College was that Professor Pope is a Fellow of that college, and that the Rev. and Mrs. G. A. Weekes kindly offered to entertain the professor's guests there. The brilliant summer weather and the beautiful gardens (which are generally considered the best in Cambridge) made this function also a great success.

The annual dinner of the Society was held in the hall of Trinity College, and with the guests some 250 were present in all, including ladies, this being, it is said, only the second time that ladies have dined in the college hall. Perhaps

it was the historical atmosphere or the oak panelling or the portraits of the celebrities connected with the college that caused the speeches after this dinner to be hardly as successful as might be expected. The hall with its lofty roof was certainly not easy to speak in, a fact which probably handicapped the speakers. After "The King," the following toasts were proposed: "The University," proposed by Mr. Woolcock, replied to by the Vice-Chancellor; "The Society of Chemical Industry," by the Master of Sidney, replied to by Dr. Armstrong; and "The Visitors," proposed by Professor Pope, and replied to by M. Paul Kestner, who spoke both in French and English.

Of the other diversions during the conference one can say but little. Various colleges were visited and those who had not before seen any of the buildings of Cambridge were able to join one of the small parties which were conducted round by the stewards, and in one or two cases the Masters of the colleges themselves turned out to welcome the guests. Many carried away an impression of life in romantic and historical surroundings which somewhat overshadowed the fact that Cambridge, like other centres chosen by the Society for annual meetings, is a centre of industry. To quote the speech of the Master of Sidney at the dinner, "The commodity offered in Cambridge is education, and the price of this cannot be found in the papers." Lecture rooms and libraries are often not shown to the visitor, who instead sees old buildings, chapels, gardens, and the famous "backs" of the colleges, which are more beautiful than the fronts. Certainly many envied those who could work in such delightful surroundings.

The conclusion of the visit was a motor trip to Ely Cathedral. Again thanks to the weather, this was successful, and the ride through the fen country with the cathedral on the hill ahead will be remembered as one of the features of the conference. The chief impression carried away by those who were able to go to Cambridge this year (nearly 200 in all, including members and their friends) was that the time was too short. Even those who had been at the International Conference as well felt that at least another week would not exhaust the points of interest. Altogether it was a memorable occasion.

The Opening of the Annual Meeting

THE first meeting was held at the Arts School, Bene't Street, on Thursday, June 21, when the Vice-Chancellor of the University (the Rev. Dr. E. C. Pearce) and the Mayor of Cambridge (Councillor G. H. Lavender) welcomed the Society.

Welcome to Cambridge

The Vice-Chancellor said he was glad to welcome the Society to Cambridge, in order to repay the bounteous hospitality which the Society had accorded him last autumn in London. The University was also glad to see them for more selfish reasons—it hoped to get a good deal out of them. He was not referring to such little items as the 200,000 guineas which the oil firms had given the University, he was rather thinking of the help the members would be to the University in placing in their works members of the University when they had been trained.

The President, in returning thanks, said that this was the first time in the history of the Society that it had received both an academic and a civic welcome, and this was appropriate, because the members represented both practice and theory. If he might say so—using the words in the most complimentary sense—the two gentlemen who had welcomed the Society represented theory and practice at their very highest.

The Annual Report

The Annual Report of the Council, which was then submitted, showed that the number of members on the register at June 21, 1923, was 5,060, as compared with 5,270 on July 4, 1922. Since the last Annual General Meeting, 248 members had been elected, 40 former members had been restored to membership, and the losses had been 498. The Council regretted to record the deaths of 51 members, of whom nine were original members. These latter included Sir James Dewar, who was President in 1887–8, and in 1918 was awarded the Society's medal for his distinguished services to pure and applied chemistry. Mr. E. V. Evans had been re-elected Honorary Treasurer, Sir W. J. Pope, had been elected Honorary Foreign Secretary in place of Professor Henry Louis, of whose services to the Society in this and other capacities, including that of President, the Council had expressed its deep appreciation. Dr. Stephen Miall resigned from being a Vice-President, on appointment as editor of "Chemistry and Industry," and Mr. Emile Mond was elected to fill the vacancy. The four Vice-Presidents who retired were Mr. John Gray, Mr. D. Lloyd Howard, Mr. Emile Mond and Mr. Edwin Thompson. Mr. Mond was eligible for re-election. The Council accepted with regret the resignation of Dr. F. C. Garrett as an Ordinary Member of Council, and Dr. R. T. Colgate, of Reading, was elected to fill the vacancy. Dr. J. H. Paterson was elected an ordinary member of Council in place of Dr. E. F. Armstrong, elected President.

The report stated that approval had been given to the proposals from the Bristol and Liverpool sections to admit associates to those sections at a nominal annual subscription on the same conditions as had been lain down in the case of other home sections.

The President had been nominated the Society's representative on the General Board of Honour of the International Air Congress, to be held in London this month, and had also been appointed one of the selection committee of four in connection with a money prize to be awarded by the Harrison Memorial Committee every three years, under certain conditions, for research work in chemistry.

The Council had resolved that the Society should, following the practice of other scientific societies, give its Honorary Membership to a limited number (not more than 30) of distinguished foreign and colonial chemists.

With regard to subscriptions, it was stated that the Council was keenly aware of the difficulty which many members had in paying their annual subscriptions, and, as a special concession to such, an arrangement had been made whereby a member who had not paid for 1921 or 1922 might rejoin the Society before the end of 1923 without payment of a further entrance fee or of the arrears of subscription.

Mr. James Craik had resigned the Latham Research Fellowship, after holding it for one year, and the Council had approved the nomination of Mr. Leslie Hall as Fellow, to carry on research at the Borough Polytechnic under the personal supervision of Dr. Charles Dorée, and in close touch with Mr. C. F. Cross, F.R.S. The subject of the research was "The Constitution of Lignone or the Lignone Complex of the Woods of Conifers and Foliage Trees."

The Council had accepted the proposal of the Organising Director of the World Power Conference, 1924, to assume entire responsibility for organising the chemical section. The conference would be held in June, 1924, in the buildings of the British Empire Exhibition, and the Committee of the Chemical Engineering Group had been asked to undertake the work.

A proposal received from the Faraday Society to hold joint meetings with the sections of the Society of Chemical Industry had been approved, and an arrangement made whereby papers intended for the Faraday Society might be read at provincial sections of the Society of Chemical Industry.

The Society had agreed to co-operate with the Association of British Chemical Manufacturers in organising the sections covering pure and applied chemistry of the British Empire Exhibition, 1924. Dr. Levinstein and Mr. E. V. Evans were nominated members of the provisional committee to arrange procedure.

Mr. C. S. Garland, M.P., in moving the adoption of the report, referred to the Society's work in bringing home to the people of the country the importance of the chemical industry and acting as a medium for the interchange of views on industrial subjects between members of the chemical profession. The admission to the Bristol and Liverpool sections of Associates he considered a move in the right direction, and one which would add immensely to the member-

ship and to the value of the Society. The step taken in connection with the Journal had already proved successful; he did not mean financially, because the Society was not one for making money, but for propagating scientific knowledge.

Mr. J. T. Wood seconded the motion, and the report was adopted without further discussion.

Treasurer's Statement

Mr. E. V. Evans (hon. treasurer), in presenting the balance sheet and accounts for 1922, said that the gratifying state of affairs in 1921, when there was an excess of income over expenditure of £3,750, had not persisted. For the last financial year they were £580 1s. 6d. to the good, and the members should be content to find that the Society's business had been conducted in such a manner as to result in a slight, yet definite, surplus. The excellent financial results of 1921 were not reproduced in 1922 owing, largely, to the fall in the Society's revenue from advertisements; this revenue was approximately £5,000 lower than in the preceding year. Had economy not been practiced, and had prices not fallen, whereby the general expenses of the Society fell approximately by the same amount, they would have been faced with a deficit rather than a surplus. During the year it had become evident to the Council that immediate action had to be taken to resuscitate the advertisement revenue, and it was felt, therefore, that the time was opportune for putting into operation the Council's long-nurtured scheme of producing a weekly journal. Concurrently with this, the Council had decided to purchase £5,000 of War Loan, essentially for the purpose of sinking a reserve fund for the weekly journal, so that to the £3,750 surplus of the previous year they had added £1,250 from the income in the year 1922 for the purpose. He was hoping, however, that they would not have to call largely upon this fund.

Dr. H. Levinstein, in moving the adoption of the statement, said the Society had always been fortunate in its treasurers, and in Mr. Evans it had a treasurer who was devoting more than a common amount of time in order to take charge of its finances.

Mr. F. H. Carr, in seconding, said that the remarkably sound financial position which had been put before the members was largely the result of the wonderful work and business acumen, imagination and forethought which the hon. treasurer had devoted to the affairs of the Society. Those who were in London felt that it was difficult to convey to the other members exactly how wide Mr. Evans's influence had been on the progress of the Society, and what a tremendous amount of work he put in.

After some questions by Mr. W. Cullen relating to revenue, the motion was carried unanimously.

Liverpool Invitation Accepted

On the motion of Mr. Edwin Thompson, seconded by Dr. T. H. Butler, it was decided to accept the invitation of the Liverpool Section to hold the Annual Meeting in Liverpool in 1924.

Honorary Members

The President said he had the very pleasant task of intimating to the members that the Council had decided to elect honorary members of the Society. They had never had honorary members before, but there had been a feeling for some time past that it would add to the dignity of the Society and increase their influence if they could from time to time single out illustrious colleagues abroad, or in the British Empire, and ask them to allow their names to be inscribed on the roll of the Society as honorary members. The Council had elected the following:—Dr. C. F. Chandler (a past president), M. Paul Kestner, Prince Ginori Conti, Professor H. Sakurai (a distinguished Japanese Professor), and Sir Dorabji Tata (a great industrialist and representative of our dominions in the East).

M. Kestner, in returning thanks, said he felt it very difficult to find adequate words with which to thank the President, Council and members. He became a member of the Society 30 years ago, and at that time he had felt that he had been adopted by a family. It was then a small family, but it had grown into a very large one. It had grown into a magnificent body, which represented not only in this country, but countries all over the world, the strength of British science and British industry. He had felt those sentiments very strongly when he had attended a meeting at Liverpool, when he was the guest of his old friend Sir Max Muspratt. He now felt that, by electing him an honorary member, the desire of the Society had been to honour the young society, the Société de Chimie Industrielle, which he represented, as its president. It was a younger sister of the Society of Chemical Industry, and it was on behalf of that younger body that he returned thanks for his election as honorary member.

Prince Ginori Conti also expressed his very hearty thanks for the honour conferred upon him, and his pleasure in being associated with the chemical industry in Italy.

Thanks to the President

On the conclusion of the President's address (reported last week), Mr. A. Chaston Chapman moved that the very best thanks of the meeting be accorded to the President for his very excellent, interesting, thoughtful and suggestive address. The address "cried out" for discussion, but he would only mention two points. The first was the present supply of young chemists. This country possessed no greater national asset than well trained chemists, of that there could be no possible doubt, and there was no better national investment than that of training young men for the profession of chemistry, provided they were the right material to train. At the present time, owing to a variety of causes—among others, the very great trade depression—there was, unhappily, an excess of supply over demand. We should be doing a great service to young men who were desirous of entering the chemical profession if we pointed out to them that chemistry was a subject which involved a very great deal of sacrifice; the road was a hard one, and only the man with special qualifications and a real love of his subject was likely to stay the course, do the profession credit, and make a position for himself eventually. He himself was very optimistic about the future of chemistry, he had always been optimistic, and he believed that, when the present period of trade depression had passed, when this and other countries got on to their legs again—and we all sincerely hoped they would before long—this surplus would be absorbed, and there would be a greater demand than ever for young, well trained chemists. The other point was the conference to which the President had referred. It was quite true that there had been in the past, and, he believed, still was, a good deal of misunderstanding between those who were manufacturing our chemists—our universities, colleges, and so on—and those to whom those chemists, later on, were offering their services. We wanted to know precisely what the manufacturers expected, and, conversely, we wanted to indicate to manufacturers, perhaps, what they ought to expect. The President had referred to a conference of teachers and professional and technical chemists which was held some years ago under the auspices of the Institute of Chemistry, but another conference was about to be held, at which he sincerely hoped those attending would hear the views of the President and a good many other chemists who were at the meeting that morning. Possibly the conference might be followed by one under the auspices of the Society of Chemical Industry, but the sooner they got together, and got at each others needs, the better for everybody concerned.

In a personal tribute to the President, Mr. Chapman said that the Society of Chemical Industry had always, happily, been very well served by its Presidents, but he could say without fear of contradiction that to none did it owe a greater debt of gratitude than to the present occupant of the Chair. (Applause.)

Receptions

The members visited the gardens and colleges during the afternoon, and were received by the Vice-Chancellor of the University, in the Fitzwilliam Museum, later. In the evening there was a reception in the Guildhall by the President and Mrs. Armstrong, followed by a dance.

Election of Officers

The conclusion of the annual general meeting was held on Friday morning, June 22, when it was announced that the result of the election for officers was—President: Dr. E. F. Armstrong, F.R.S. (re-elected); Vice-Presidents: Dr. T. R. Butler, Mr. F. H. Carr, Professor G. G. Henderson, F.R.S., Mr. Emile Mond (re-elected); Ordinary Members of Council: Professor P.P. Bedson, Dr. R. T. Colgate (re-elected), Professor A. R. Ling, Dr. Joseph Reilly.

Chemistry and the Gas Industry

The President, in opening the meeting on Friday morning, June 22, expressed his very great regret that, at a late hour on the previous night, a messenger had arrived from London with a letter from Dr. C. C. Carpenter (President of the South Metropolitan Gas Company), who regretted that he was unable to come to Cambridge to receive the Society's medal and to deliver his address to the members.

In explanation of the Society's medal, the President said it was awarded to a scientist, a chemist, who had contributed either to the advancement of science or to that of the Society. It was first instituted in 1896, when it was awarded to Mr. Glover, of sulphuric-acid fame. Dr. Carpenter had joined the Society 30 years ago. Essentially, he was an engineer, and, like many engineers, he was early attracted to chemistry. He (the President) supposed that Dr. Carpenter could justly be regarded as the prototype of the chemical engineer, of whom so much was heard to-day. Users of gas were inclined to think, said the President, that they suffered under monopoly, and received an article which was just good enough to deprive them of any legal remedy to get it bettered. That had never been Dr. Carpenter's policy. His policy had been to provide those fortunate people who lived in his area with a gas so good that nobody would wish to change it for any of the other forms of lighting or heating. That policy, although in a sense a commercial policy, had only been made possible by the technical work initiated and led, and in part contributed to, by Dr. Carpenter. Reflecting on Dr. Carpenter's work for the Society of Chemical Industry, and for the chemical industry itself, the President reminded the members that Dr. Carpenter was President of the Society during two critical years; he became President in October, 1914, and saw the Society through the first two difficult years of the war. During his period of office he was one of the founders and the first Chairman of Council of the Association of British Chemical Manufacturers. British chemical manufacturers had never been able to pull together in the way that their Continental rivals had succeeded in doing. If there was one man who had succeeded in harnessing the team, it was Dr. Carpenter, and his hands on the reins were so light that the team, almost before it knew it, had got together.

Abstract of the Paper

Sir William Pope, abstracting Dr. Carpenter's paper, said it was a very comprehensive account of the past history of the gas industry and its present condition, and an extremely illuminating exposition of what the author imagined the future of the industry would be. Dealing with the early history of the distillation of coal, he told how, in the Transactions of the Royal Society in 1739, the Rev. Dr. Clayton had communicated a paper, the first published on this subject, in which Dr. Clayton had said: "I got some coal and distilled it in a retort in an open fire. At first there came over only phlegm, afterwards a black oil, and then likewise a spirit arose, which I could no ways condense; but it forced my lute or broke my glasses. I then had a mind to try if I could save any of this spirit, and in order to do this I took a tubinated receiver, and putting a candle to the pipe of the receiver, whilst the spirit arose, I observed that it catched flame, and continued burning at the end of the pipe, though you could not discern what fed the flame. I then blew it out and lighted it again several times, after which I fixed a bladder. I kept the spirit in the bladder a considerable time, and endeavoured several ways to condense it, but in vain."

Early Work on Gas

Dr. Carpenter told of the early work of Murdoch and Watts on the production of coal gas, and then came what was a very characteristic touch on the part of Dr. Carpenter. He was primarily an engineer, and therefore one would not suspect him of having any bias towards chemical subjects. He had pointed out, in dealing with the conditions in which the gas industry was carried on, that we could look upon the whole industry which was concerned with the distillation of coal as a kind of circle, in the centre of which the actual process of coal distillation stood, and, radiating from this centre, ancillary to the actual process of coal distillation itself, were the enormous complexity of industries which were based on the utilisation of coal and its products. Commenting on this picture, he said that everywhere we met the hand of the chemist controlling these industries, but when we came to the primary operation, the destructive distillation or carbonisation of coal in the production of town's gas, we saw but little evidence of his work in the operations generally carried on to-day. The plant employed was, in principle, practically what it was a century ago. He did not mean to imply by this that no development had taken place; the retorts were larger and longer, and, being more resistant to heat, were worked at a higher temperature. Also, machinery had been substituted for hand labour in many of the subsidiary operations. These tasks were peculiar to the functions of the engineer, and he had performed them admirably. He was, of course, carrying out what was primarily his own particular task, *i.e.*, the mechanical operating of a particular process. Dr. Carpenter went on to ask, "What must be said of a process the raw material of which has been most inadequately studied?" and throughout the whole of the address the keynote was to the effect that coal itself, the original raw material used in gas manufacture, had received far too little study at the hands of the chemist.

Our Knowledge of Coal

Dr. Carpenter then gave an account of our present knowledge of the nature of coal, and contrasted the very imperfect state of the information which was possessed as to coal itself with the very complete and highly complex knowledge that we now possess of the constituents of coal tar. It was obvious that the picture the author had in mind was one in which he saw that the question of the composition of coal tar, and the utilisation of the enormous number of chemical substances which it contained, had been carried to a very high pitch of perfection, and that many great industries had been founded upon this minute examination of coal tar itself. Apparently, he foresaw that ultimately we should be able to utilise coal in the same multiplicity of ways in which we now utilise the constituents of coal tar, by reason of getting, in the fullness of time, a more perfect knowledge of the composition and constitution of coal itself. While it was a relatively simple matter to lament the small amount of information which even to-day exists upon the complex questions of coal constitution, only those in intimate touch with the subject could appreciate the great intricacy of the problem. Despite the considerable work carried out in recent years, it was still a very bewildering matter to attempt to form a clear impression of the position to-day. One body of workers had studied the paleobotanical side with commendable results, others had submitted the coal substance to the action of solvents and to chemical reagents; another set of investigators had investigated the coking properties of coal and its general behaviour under heat. We were indeed only collecting bricks wherewith to build a temple of our knowledge, and as yet no master architect had arisen to design the the structure. Until that happened it would appear that we must be content to study effects rather than determine causes. He believed that much greater knowledge of organic chemistry was required before this large accumulation of knowledge was correlated. The general idea which inspired Dr. Carpenter was that the engineer had done all he could, and it was now the part of the chemist to take the work in hand, to study the raw material, coal, with the same energy and efficiency as had been devoted to the study of the components of coal tar.

Discussing the behaviour of coal under heat, Dr. Carpenter stated that Weyman had recently shown that a more rapid heat transference is effected by the gases evolved during carbonisation than by conbustion through the charges or by radiation. In the case of a bituminous coal this method of heat transference is retarded by the formation of plastic layers, whereas with anthracitic coal heat transference by means of the gases can take place readily, and this accounts for the rapidity of carbonisation of these coals.

"Destructive Distillation" no Misnomer

Discussing the coking of coal, Dr. Carpenter had given a brief account of the way in which the binding of the coal is affected by the oxygenated constituents of the coal itself. He concluded the section by saying that probably a true picture of the mechanics of the carbonising process was that it was one of high velocity, *i.e.*, that so soon as the coal particle was raised to the required temperature, the destructive distillation process proceeded very rapidly. The lag in the

process arose from the time taken to raise the coal particles to the required temperature, and this was accentuated by the poor conductivity of the material and the formation of the plastic state through which the coal passed. This plastic state proceeded in layers in each coal particle from outwards inwards, and thus retarded the evolution of gas. When the plastic state was reached at the centre of the coal particle, it might be imagined that a turbulent state of affairs existed and the gases evolved had to pass the gauntlet of the maze of cells of the hot coke to gain their freedom. The designation of "destructive distillation" is no misnomer; in fact it was always a wonder how so many of the complex hydrocarbons withstood the drastic treatment to which they were exposed.

Factors Influencing Carbonisation

Putting on one side the many subsidiary factors influencing carbonisation, Dr. Carpenter said that the main factors which determined the value of carbonising results were: (*a*) The type of carbonising vessel and the pressure maintained therein; (*b*) The temperature to which the mass is eventually raised; (*c*) The rate at which heat enters the mass and the time taken for the mass to attain the final temperature; (*d*) The degree of heat and contact to which the volatile products from the coal are subjected; (*e*) The state of division of the mass under carbonisation.

Dr. Carpenter proceeded to say that the possibilities of low-temperature carbonisation were being slowly developed. The future of low-temperature tar was as yet unknown, but extensive investigations by Fischer and his colleagues had added appreciably to our knowledge of the subject. It would appear that we were only on the fringe of the possibilities presented by low-temperature tar, and the future of the process itself might depend upon the results of this investigation. He was unable to appreciate, with the present state of knowledge of the low-temperature distillation of coal, the economic advantages of this process, and imagined that a suitable solid, smokeless fuel was to be obtained eventually by the carbonisation of coal under special conditions, but at high temperature. The study of low-temperature tar had, however, proved of great value in interpreting the carbonisation process itself, and it might eventually result that the study of tars produced at various temperatures might be one of the keys to solving the problem of the carbonisation process.

The Future of Coal Carbonisation

In any discussion on the merits of various methods of coal carbonisation, it must be borne in mind that the adoption of any one method was generally determined by special local requirements, or the demands of the times. As coal was not only a source of gaseous energy but also of tar products, nitrogen and sulphur compounds, development would take place along those lines which gave the highest yields of the particular products required. Whereas low-temperature carbonisation gave a comparatively low yield of ammonia, a very rich gas with a high yield of tar rich in low boiling-point paraffins, and a soft and easily burning coke, gasification with air and steam on the Mond system resulted in a high yield of ammonia and a high volume of a low-grade gas.

The lecture sought to bring home the fact that the distillation of coal in the production of town's gas was not only a chemical industry, but that its development was only possible along lines to be laid down by the chemist and supervised by him. Vivid though Dr. Carpenter's dreams of the future might be, he had never yet visualised the community wholly supplied with gaseous thermal energy. He believed that gaseous and solid fuel have each their sphere of usefulness and that their systematic use would go hand in hand. He also believed that in the largest cities, as in the smallest villages, the gas works would be the portal through which all our raw coal would be required to pass, and while it was the chemist to whom we must look for the achievement of that ideal, it was certain that he would need all the assistance he could obtain from his brother worker, the engineer, who had no longer the monopoly of "directing the great sources of power in Nature for the use and convenience of man."

The President, after thanking Sir William Pope for his abstract of Dr. Carpenter's paper, asked Mr. E. V. Evans to accept the medal on behalf of Dr. Carpenter. Mr. Evans was the chief assistant, adviser and aide-de camp to Dr. Carpenter on the chemical side of his work.

Presentation of the Medal

Mr. E. V. Evans said he had reason to know that Dr. Carpenter was deeply appreciative of the honour conferred upon him by the presentation of the Society's medal. Dr. Carpenter had laid down as a fundamental principle that the coal gas manufactured by his company should not vary except within very small limits from hour to hour, even from minute to minute, and that it should, as nearly as possible, burn to carbon dioxide and water vapour, and for this purpose he had devised a process for the elimination of sulphur compounds. He had further decided that the consumer of coal gas, whether for the production of light, heat or power, should not be required to adjust his appliances, and, with the supply of a constant quality of coal gas, he had devised apparatus the air supply to which was fixed and unalterable, and which gave maximum efficiency. This had, in some quarters, been considered to be the work of an idealist, for it had necessitated not only elaborate control of the gas manufacturing process, but also the manufacture in the company's own works of the standard appliances required for burning the gas; but Mr. Evans could assure them that this large-minded policy had, by its results, paid handsomely.

The Work of Dr. Carpenter

Mr. W. J. U. Woolcock (manager, Association of British Chemical Manufacturers) said that if anything were possible that day to mitigate their sense of loss in not having Dr. Carpenter with them, it would perhaps be the "masterly" analysis—and he used the word advisedly—of Dr. Carpenter's paper which had been given by Sir William Pope. The man to whom the Society had given the greatest honour it could bestow was, in his judgment, a very many-sided man. They were not so familiar with the various aspects of his character as they would be were it not the fact that Dr. Carpenter deliberately repressed himself in many directions. He was a great lover of art and a great student of literature, and there were many branches of activity in life into which he could have entered most successfully, and in which he could have made his mark equally as well as he had in chemistry and engineering. Mr. Woolcock, dealing with the work of Dr. Carpenter in connection with the politics of chemical industry, mentioned the Association of British Chemical Manufacturers. That Association owed an enormous debt to Dr. Carpenter. In this country all attempts to induce chemical manufacturers to combine were a failure until Dr. Carpenter came along; he had seized the opportunity afforded by the war. There had always been in the chemical world, as far as he knew, one big question which might at any time wreck the industry, and that question was the disposal by the gas companies of their chemical products. The gas companies, with the security of their Acts of Parliament, were bound to pour out their by-products if the price of gas was to be reasonable, and, on the other, the chemical manufacturers had no constant product such as gas to help them out when necessary, but had the necessity of manufacturing chemicals and selling them in this country. That was the real problem which had to be solved, and the problem which the genius of this man, Dr. Carpenter, had overcome.

This concluded the business of the meeting.

Solder for Aluminium

Most of the metals commonly used in solders, except magnesium, are electro-positive to aluminium, so that any metals used in making a soldered joint of aluminium act electrolytically in the presence of moisture as positive galvanic poles, accelerating the corrosion of the aluminium. Magnesium cannot be utilised advantageously even though it is electro-negative to aluminium, because the metal disintegrates rapidly in the presence of moisture. Soldered joints of aluminium which are to be exposed to moisture should be protected against corrosion by a paint or varnish.

As a result of work recently carried out by the U.S. Bureau of Standards it has been found that various compositions of zinc-tin and zinc-tin-aluminium solders give the best results. The tensile strength of a good aluminium solder is about 7,000 lb. per sq. in., for those with higher tensile strength have, in general, their temperature of complete liquation too high for soldering purposes. As a rule the strength of an aluminium-soldered joint depends upon the type and upon the workmanship.

Is Formaldehyde a Synthetic Organic Chemical?

Official Inquiry Continued.

MR. Cyril Atkinson, K.C., the referee under Part I of the Safeguarding of Industries Act, resumed the hearing as to the complaint of the Chemical Merchants' and Users' National Vigilance Committee that formaldehyde has been improperly included in the Board of Trade list of articles dutiable under Part I of the Act, on Friday, June 22nd.

Mr. E. Parry's Evidence

Mr. E. Parry, the first witness for the complainants, was again cross-examined by Sir Arthur Colefax, who suggested that phenanthrene, a coal-tar hydro-carbon, could be prepared synthetically.

Mr. Parry: I believe so.

Sir A. Colefax: One way is to take dibenzil and pass it through a heated tube, and then phenanthrene is formed.

Mr. Parry: Candidly, I have not got the chemistry of phenanthrene in my mind.

Sir A. Colefax put it that the formation of phenanthrene in the way he had just mentioned was a recognised synthetic method. This was obviously a synthesis in which there was a splitting off of hydrogen. Equally there might be a synthesis by the addition of hydrogen as well as by the splitting off of hydrogen, and in point he mentioned anthracene dihydrate, which he believed the witness would not question was a synthesis.

Mr. Parry: Yes, I think it is.

Sir A. Colefax said that this was an example of the mere addition of a molecule of hydrogen to a complex molecule of anthracene, and this the witness had admitted was a synthesis.

The Official Referee said that this seemed to him to be an important admission.

Mr. Parry explained that there were undoubtedly a number of bodies prepared by reactions which were definitely those with which the synthetic chemist had to do. He was proceeding to particularise, when Sir A. Colefax put it that he had tacitly admitted that both the operations he had instanced were synthetic—the preparation of phenanthrene on the one hand and the preparation of anthracene dihydrate on the other.

Mr. Parry: I admit that both those are synthetic.

Sir A. Colefax then took another instance, what he described as the perfectly simple synthesis of anthraquinone from anthracene, and he suggested that this formation synthetically was exactly on a par with the formation of the dihydrate.

Mr. Parry agreed, with certain qualifications.

Mr. W. F. Butler

Mr. Butler, a director of the firm of R. W. Greeff and Company, London, said that his firm was doing a wholesale business in chemicals. It was not his experience that formaldehyde was regarded as a fine chemical; it was not so regarded in the trade. The turnover of his own firm amounted to some hundreds of tons. The total production of formaldehyde to-day, in his belief, was in the neighbourhood of 10,000 tons annually. Principally it came from America and Germany. In 1920 the import into Great Britain and the Colonies was 1,800 tons. It came generally in 40-gallon casks; acetic acid or sometimes lactic acid was used on the inner lining of the casks so as to prevent the wood from discolouring the material. He had made some researches into catalogues and other trade literature with a view to finding out how formaldehyde was listed. In the price list of his own firm, chemicals were divided into "technical chemicals" and "fine chemicals and pharmaceutical preparations." The reference to formaldehyde was under the former designation. He referred to the price list of another firm, issued in July, 1921, before the coming into operation of the Safeguarding of Industries Act, in which there was a general heading "chemicals," followed by a special heading "fine chemicals," and formaldehyde was placed under the general and not under the special heading. The witness also referred to a number of trade journals in support of his contention.

Asked what were the preponderating uses of formaldehyde, Mr. Butler said that the principal use in his experience was the making of condensation products; 90 per cent. of the formaldehyde dealt in by his own firm was for industrial purposes, in which category he did not include disinfecting purposes. He had never heard formaldehyde described in the trade as a synthetic preparation. The quality of formaldehyde guaranteed was 40 per cent. by volume. That was the only guarantee given. In a very small fraction of his firm's business in formaldehyde his firm was asked that the formaldehyde should conform to the British Pharmacopœia, but his firm declined to give such an undertaking.

Mr. Swan: If you sold a consignment of formaldehyde and the purchaser came back and said that it did not conform to the British Pharmacopœia, would he be able to substantiate his claim that it was a bad delivery?

Mr. Butler: Certainly not.

Sir A. Colefax, cross-examining, asked whether there was a considerable sale of formaldehyde for disinfecting purposes?

Mr. Butler said that the sale under this head was comparatively small.

Sir A. Colefax suggested that the substance had now a large sale for the disinfection of wool as a precaution against anthrax germs. He also asked the witness whether it had come under his notice that formaldehyde containing a trace of iron had been rejected?

Mr. Butler said that he had only come across a case of iron in formaldehyde once.

Sir A. Colefax: Would you describe as impure a body that contains one-thousandth of one per cent. of iron?

Mr. Butler: I cannot answer; I am not a chemist.

Sir A. Colefax: Commercially would you consider that a very high or a very low degree of purity?

The Official Referee: It sounds to me very near purity.

Sir A. Colefax then went with the witness through the various catalogues which had been put in.

In reply to further questions, Mr. Butler agreed that in this country the sale of formaldehyde had increased very considerably during the last two years. Asked to give some indication as to the increase which had taken place between 1913 and 1922, he said that he could not give the figures, but the sales would certainly be several times greater in the latter than in the former year.

Mr. Trevor Watson then examined the witness, and asked if he would agree that America was the largest producer of formaldehyde?

Mr. Butler said that he thought America and Germany were about equal.

Asked at what figure he would place the total world production, he mentioned 10,000 tons.

Mr. Watson: It is suggested to me that the correct figure is between 5,000 and 6,000 tons. For how long, in your view, has it been more than 5,000 tons?

Mr. Butler: For several years at any rate.

Mr. Watson referred to a Government publication of the United States which gave the American production of formaldehyde in 1914 at 8,426,247 lb. (about 3,500 tons). The German production was given in an official volume for 1920—though the exact year to which the figure related was uncertain—as one million kilos (about 1,000 tons). The Canadian production was given as 1,154,902 lb. He asked the witness if he could mention a typical heavy chemical which was not produced in substantially larger quantities than these?

Mr. Butler thought that acetic acid would be one such; he could not agree with the suggestion behind the counsel's question, but he was unable at the moment to think of any other product which would come within this category.

Counsel mentioned the names of two great German chemical houses, which he contended were essentially regarded as fine chemical manufacturers and manufactured formaldehyde.

Mr. Butler said that he did not know that these firms only manufactured fine chemicals. He would go no further than to say that they were principally fine chemical manufacturers.

Mr. Watson further asked whether he knew of any firm of chemical manufacturers who could be said to be more than "principally" fine chemical manufacturers?

Mr. Butler instanced Burroughs Wellcome and Co.

Mr. Watson believed that this firm were entirely manufacturers of pharmaceutical products, and he asked again whether, apart from those who manufactured pharmaceutical products solely, there were any fine chemical manufacturers exclusively who were making formaldehyde?

Mr. Butler said that it was not within his power to distinguish between fine chemical and pharmaceutical products.

Mr. Watson asked whether the witness's evidence was given on the basis of the distinction that a fine chemical was a pharmaceutical product?

Mr. Butler: Very largely.

Further Trade Evidence

Towards the close of the sitting several trade witnesses were called and their examination more rapidly put through. Some of the evidence was taken *in camera*, even the official shorthand writer being excluded, and other parts of it, containing essential figures or names, were written down by the witnesses and were not stated in public.

Mr. R. R. Wilkins (Victor Blagden and Co.) was the last witness to be called by Mr. Swan, and on request he wrote down the quantities of formaldehyde with which his firm had dealt last year. Asked how he regarded formaldehyde, he said that he regarded it as an industrial chemical, and had always classified it as such. Asked if he could give any figure of world production, he said that he had a very good idea as to the American production, and based on that he would put the world production at between 11,000 and 12,000 tons. He had never heard formaldehyde described in the trade as synthetic. He gave no guarantee for formaldehyde beyond the 40 per cent. volume.

The Official Referee asked witness what he meant exactly by a heavy chemical?

Mr. Wilkins said that he followed largely the trade custom. If a chemical was sold in large quantities for industrial uses it was generally so ranked.

Evidence for Board of Trade

Sir A. Colefax then called trade evidence against the application.

Mr. W. T. Bruce, of the firm of that name in Lombard Court, wrote down the quantities in which he dealt, and declared that he would classify formaldehyde as a fine chemical. As to its pharmaceutical uses, he would say that for surgical and similar purposes it was not used much, but for disinfecting purposes a very considerable quantity was used.

Cross-examined by Mr. Swan, the witness agreed that he dealt mainly with heavy chemicals, but he dealt also with fine. In his recollection, as far back as 1898, formaldehyde had always been classified as a fine chemical, though he could not point to any trade literature of that time in support of his statement. His own sales were mainly to users, not to retailers. In his opinion if a chemical when first brought out was regarded as a fine chemical, its subsequent use in large quantities did not affect the primary fact that it was a fine chemical. Should the industrial demand for this substance for any reason cease, it would become a pharmaceutical chemical simply, and in that respect the original view that it was a fine chemical would not be quarrelled with. He maintained that formaldehyde was a fine chemical, whether it was water-white or not, and he would still regard it as such even if it were placed on the market in a condition other than water-white. He confessed, in answer to the Official Referee, that the test of a fine chemical was extraordinarily difficult to define.

Dr. Walkey, of the London Chemical Works, Southall, stated that his firm started the manufacture of formalhehyde seven months ago.

Mr. W. T. Allen, senior director of the firm of Allen, Craig, and Co., merchants, dealing in fine and heavy chemicals, said that his firm dealt in formaldehyde for several years in fair quantities. He declined to give a precise definition of the terms "fine" and "heavy." Water-whiteness was one of the requirements of the substance used.

Mr. W. Gregory, B.Sc., an analytical and metallurgical chemist, said that he regarded formaldehyde as a fine chemical. The quantities with which he had to deal were usually 40 per cent. by volume and water-white. He imagined that being water-white the formaldehyde would comply with the B.P. requirements. The fact that formaldehyde was water-white was a very good test that it was free from at any rate certain of the more common impurities. The chief use for formaldehyde within his own particular range of experience was for waterproofing gelatine used in the printing industry. He was asked by the Official Referee what he meant by a fine chemical, and he replied that a fine chemical was first of all an expensive chemical, in which the cost of chemical supervision in its production was high, and also the material should be one having a high degree of purity. By a high price he meant particularly a high price of supervision, irrespective of the price of the material apart from such supervision.

Mr. Swan, in cross-examination, said that formaldehyde sold at under £40 a ton before the war, and he asked witness if that could be called a high price?

Mr. Gregory replied that it was relatively a high price. Asked whether he could name any other admittedly fine chemical that could be got at £80–£90 a ton to-day (which was the price he had mentioned as being, he thought, the current price for formaldehyde), he instanced Epsom salts, the B.P. preparation, which could be got at £7 or £8 a ton, and which he regarded in certain respects as a fine chemical. He distinguished in this connection between ordinary chemicals and B.P. preparations, because the latter had to be free from lead and arsenic, and this introduced the element of scientific control into their manufacture.

Other evidence was taken *in camera* and an adjournment was made till June 28.

Oil Fuel for Clay Drying

To the Editor of THE CHEMICAL AGE.

SIR,—We have read with considerable interest an article on the use of "Oil Fuel for Clay Drying" that appeared in your publication of June 16, 1923.

The remarkable results obtained and the economies realised are certainly very clearly portrayed, but the description of the oil fuel burning equipment which is responsible for these results has been referred to as a plant consisting of three blow lamp jets similar in principle to the ordinary blow lamp as used by painters. This description is so incomplete, that we feel sure you will appreciate our anxiety to have a correct description of the apparatus placed before your many readers, the more so when it is known that other makes of oil fuel burners were tried on this particular furnace and failed to give anything approaching satisfaction.

The Rotamisor Burner is the result of ten years' work and has cost many thousands of pounds to perfect, and it is now a highly efficient, though simple, piece of apparatus and so designed that it can be operated without the use of air compressors, oil pumps, oil heaters, and other complicated units.—Yours, etc.,

COMBUSTIONS, LTD.

31, St. Mary Axe, E.C.3.

Chemical Matters in Parliament

Qualifications for Public Analysts

MR. C. S. Garland (House of Commons, June 26), asked the Minister of Health whether his attention had been directed to the terms and conditions offered by the County of Gloucester and the City of Gloucester for the appointments of public analyst to the said county and city; whether he was aware that these authorities had appointed as public analyst a person whose qualifications did not appear to be within the terms of the regulations as to competency of public analysts, issued by the Local Government Board for England and Wales in March, 1900, in accordance with the provisions of the Sale of Food and Drugs Act, 1899; and whether he proposed to confirm the appointment to this post of any person who was unable to produce evidence that he possessed the qualifications referred to.

Mr. Neville Chamberlain: The answer to the first part of the question is in the affirmative. The appointments proposed by the County Council and the City Council have been submitted for my approval, and I am in communication with those authorities as to the qualifications of the gentleman whom it is proposed to appoint.

From Week to Week

MR. WILLIAM W. SPENCE, chemist, Linlithgow, has just been appointed Baron Bailie of Blackness, N.B.

THE CORNWALL CHEMICAL CO., Cornwall, New York, U.S.A., will rebuild the part of their plant recently destroyed by fire, at an estimated loss of $100,000.

THE CITY OFFICE of the United Paint Co., Ltd., has been removed from 15, Great St. Helens to 1, Laurence Pountney Hill, Cannon Street, London, E.C.4.

A SUPERPHOSPHATE FERTILISER FACTORY is to be built at Venice by Societa General Montecatini, Milan. The plant will have a capacity of 110,000 tons per annum.

MEADE-KING, ROBINSON AND CO., LTD., announce that they have removed their London office from 3, London Wall Buildings, E.C.2, to 523, Salisbury House, Finsbury Circus, E.C.2.

LADY BRUNNER and Mrs. Roscoe Brunner have each given £100 in response to the appeal for the four women's colleges in Oxford, a benefactor having offered £100 provided that ninety-nine others gave a similar amount.

BARD AND WISHART, the British agents of the Swiss dyestuff firm, Durand and Huguenin, S.A., of Basle, are authorised to state that the rumour current lately and published last week (p. 684) is purely imaginary and that the firm in question has no connection with the German I.G. or any other combine.

AN INTERESTING form of advertisement has been received from Evershed and Vignoles, Ltd., electrical engineers, Acton Lane Works, Chiswick, London, W.4, in the form of a glass ash-tray which contains on the underside so that it is visible from the top, a reminder of the firm's well-known M E G insulation tester.

THE GOLD MEDAL of the Royal Society of Medicine, "awarded triennially to a scientist, man or woman, who has made valuable contributions to the science and art of medicine," has this year been awarded by the Council to Professor F. Gowland Hopkins, F.R.S., Professor of Biochemistry in the University of Cambridge.

THE USE OF CHEMICAL AGENCIES for the protection of crops and fruit trees from parasites is steadily extending in America. An airship has now been specially equipped for the purpose of travelling over infected areas and of spraying the vegetation with insecticides in the form of powder or liquid. The results of the experiments are reported to be favourable.

IN REFERENCE to the purchase of 500,000 yards of khaki drill in England by the United States Marine Corps, officials said the British knew a secret of dyeing which the American mills evidently had not learned, and that, while the cloth made by the Spinner mills at Manchester had proved quite satisfactory, piece-dyed cloth produced by the American mills had turned out otherwise.

WE ARE INFORMED that Glenfield and Kennedy, Ltd., of Kilmarnock, have recently been asked by the Blast Furnace Department of Dorman Long and Co., Ltd., if they would care to take over a Kennedy water meter supplied in 1857, which only requires at this date average repair to put it in working order, and which has, therefore, actually been in operation over 65 years.

ON MONDAY next, July 2, the Manchester and Sheffield Tar Works Co., Ltd., of Attercliffe, Sheffield, will open offices at Prince's Chambers, 37, Hallgate, Doncaster (Telephone No.: 728 Doncaster; Telegraphic Address: Distillation, Doncaster), to which address all communications should be directed. The firm's works will be as before, at Barnby Dun, near Doncaster, Sheffield and Manchester.

A SOLID SILVER SALVER has been sent by David Waldie and Co., Ltd., manufacturing chemists, of Konnagar, Calcutta, India, to be presented to the Town Council of Linlithgow as an addition to the handsome loving cup that was given last year by numerous subscribers in memory of Dr. David Waldie, who was associated with the discovery of the anæsthetic properties of chloroform, and was the pioneer of the chemical industry in India and founder of the firm.

A TON OF EXPLOSIVE MATERIAL, sent under an extraordinary subterfuge, has been seized by the Free State Government. Some weeks ago a ton of "salt" was consigned from Belfast to a provision merchant in County Meath. The "salt," which was made up in half-pound packets, aroused the suspicions of the Customs officials, who opened it and found material for manufacturing high explosives. The material was sent to The Army Chemical Corps, where it is being turned into a commercial explosive for use in Irish quarries.

THE BRITISH NON-FERROUS METALS Research Association has undertaken an extensive series of investigations on die-casting alloys, which will spread over at least three years and entail an expenditure exceeding £10,000. The Department of Scientific and Industrial Research has promised most substantial financial support to the research. The Research Associations of the British motor and allied industries, of the scientific instruments, and of the electrical and allied industries, have also afforded their support, and are represented on the committee controlling the investigations.

SIR CHARLES OMAN, presiding at the annual meeting of the Royal Numismatic Society in London, stated that there was a rumour that a British nickel coinage was in progress for threepenny and sixpenny pieces, and he thought that it might do much to improve the silver issue. The Government had offered £100 for the best medal design for a coin to c lebrate the opening of the British Empire Exhibition, and a series of small bonuses for praiseworthy designs, and he hoped that that would lead to a new official set of British coins, as the present was the weakest series ever issued.

IT IS UNDERSTOOD that Dr. G. N. White, D.Sc. (London), has joined Oscar Guttmann and Sons, consulting engineers and chemical advisers, of 7 and 8, Idol Lane, Eastcheap, E.C.3, and will be responsible more particularly for all matters relating to the ceramic industries and in regard to organic chemical and nitrogen fixation work. Dr. White will be remembered in connection with his work for the Munitions Inventions Department and in the dyestuffs industry; was for some years chief chemist to the Royal Worcester Porcelain Works, where he perfected and carried out researches on laboratory porcelain.

AT THE GENERAL MEETING of the large German colour works, the Farbwerke vorm Meister Lucius and Brüning, recently held at Höchst-on-Main, it was stated that the occupation of the works of the German dyestuff manufacturers lasted from May 14 to 26. During this period over 14,000 tons of coal-tar colours were seized and removed from the works. As this is equivalent to the total quantity of dyestuffs to be delivered to all the Allies in 1923 under the Peace Treaty as reparation colours, it is considered improbable that further seizures will be made. It was mentioned that the French troops acted with moderation, and that the removal of the colours took place without any unpleasant incidents of moment.

A SCHEME for the raising of the status of the Huddersfield Technical College to that of a College of Leeds University is projected in Huddersfield. The principal recommendation is that the Leeds University be approached with a view to raising the Technical College to the rank of a University College, at least in some departments, after the manner of the various colleges associated with the University of London, and of the Manchester School of Technology with the University of Manchester. Much useful work has been done at the Technical College, which serves not only the borough of Huddersfield but a large area in the West Riding with a population of about 200,000. More than 3,000 day and evening students attend the College, and there are several hundred classes. Recently, in response to an application for an annual contribution towards the maintenance of the Leeds University, the Huddersfield Corporation decided to grant a sum of £1,000 annually.

Swiss Dyestuff Amalgamation

IN reference to the statement published last week that some form of amalgamation of Swiss dyestuff manufacturers with German and French firms was foreshadowed, the Geigy Colour Company states that only one of the Swiss dyemakers, Durand and Hugerin, S.A., is concerned in the combination mentioned. The other Swiss dyemakers, viz., the Society of Chemical Industry, Messrs. J. R. Geigy, S.A., and Messrs. the Sandoz Chemical Works, have no connection whatever with the German I.G. nor with Messrs. Durand and Hugenin, and have no intention of joining the same. This statement is made authoritatively also on behalf of the other two Swiss firms.

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Patent Literature

Abstracts of Complete Specifications

197,971. ACTIVATED CARBON FROM PEAT, LIGNITE, SAWDUST OR OTHER CARBONACEOUS MATERIAL, MANUFACTURE OF. Count L. le W. Hamon, Prospect Park, Ballycumber, King's Co., Ireland, and T. H. Byrom, 41, Lower Kennington Lane, London, S.E.11. Application date, November 18, 1921.

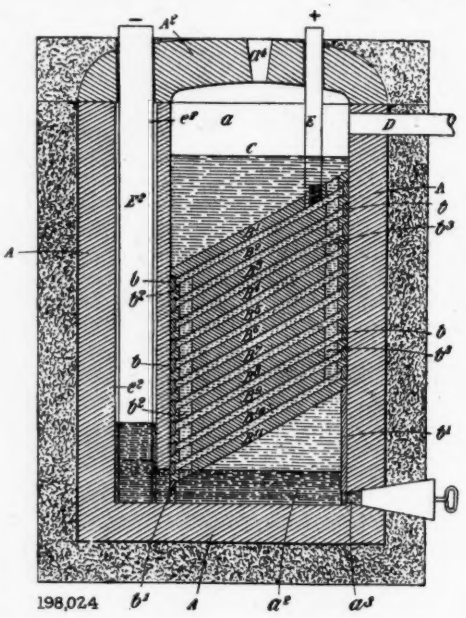
Peat or other carbonaceous material is saturated with aluminium sulphate, magnesium chloride or calcium chloride, and a soluble phosphate, phosphoric acid, or a soluble carbonate is then added to precipitate an insoluble metallic phosphate or carbonate. The product is then filter-pressed, washed, dried and carbonised, and the resulting carbon is treated with hydrochloric acid to remove all soluble matter.

197,974. REFINING OF OILS. G. J. Lemmens, 64, Carlisle Mansions, Westminster, London, S.W. Application date, November 22, 1921.

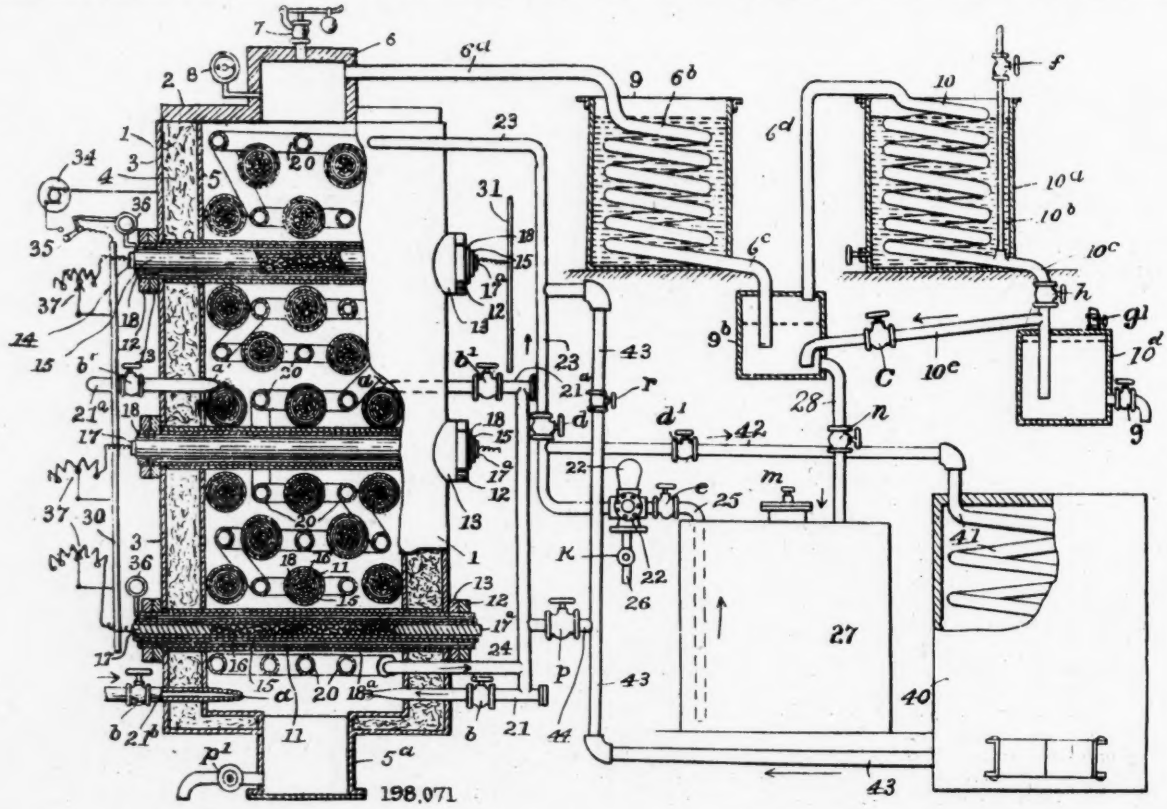
The process is for neutralising with alkali the free fatty acids contained in crude saponifiable oils. It is found that these acids are saponifiable at a lower temperature, with weaker alkali, and in a shorter time under suitable conditions, than neutral oil. In this invention the saponification takes place under such conditions that the alkali solution is always in large excess and the oil is sprayed into it in a very finely divided condition. The neutralised oil rises to the top and is continuously removed for further treatment, and the alkali is renewed as required. The product is a highly refined oil suitable for edible purposes.

198,024. ELECTROLYSING FUSED SALTS OF METALS AND RECOVERING THE METALS AND ACID RADICLES, AND THE APPLICATION TO THE RECOVERY OF VALUABLE CONSTITUENTS FROM METAL BEARING ORES AND MATERIALS. E. A. Ashcroft, 32A, Liverpool Street, London. Application date, February 18, 1922.

The apparatus is particularly suitable for electrolysing zinc or lead chloride for the recovery of the metal and chlorine. The electrolytic cell A is heat-insulated by a layer of kieselguhr, and contains eleven electrodes B^1 - - - B^{11} arranged in an inclined position and slightly separated from one another. A space *a* is provided above the electrolyte to receive chlorine, and a reservoir a^2 at the bottom for molten zinc or the like.



The positive electrode E consists of a rod of graphite screwed into the plate B^1, and the negative electrode E^2 consists of a graphite rod dipping into the molten metal, which is in contact



with the lowest plate B^{11}. The graphite electrodes B^1 - - - B^{11} are separated by distance pieces *b* of fused silica or the like, and the inner wall of the vessel A provides an insulating shield to the edges of the electrodes. Fused zinc chloride at a temperature of 350°–400° C. is introduced through the opening a^4, and the electrolyte is maintained at 450°–500° C. either by the electric current, by a supplementary alternating current, or by external heating. Zinc is liberated on the upper faces of the electrodes and flows downwards through the openings b^2, while chlorine is liberated on the lower faces and flows upwards through the openings b^3, so that the two do not come into contact. With this apparatus, using two volts per couple, an energy efficiency of 64 per cent. may be obtained, compared with about 30 per cent. by the usual apparatus. A modified form of cell is also described, in which the electrodes are in the form of superposed cones, and another form in which the electrodes are in the form of saddle-shaped plates.

198,049. Inks, Paints, Varnishes, Dyes and the like, Manufacture of. J. W. Spensley and the Chemical Engineering Co. (Manchester), Ltd., 49, Deansgate, Manchester. Application date, February 23, 1922.

The ingredients of the ink, paint or the like are first mixed in a pug mill and then passed through a high speed centrifugal pinned disc mill having a peripheral speed up to 20,000 ft. per minute; such a mill is described in specification 186,462 (see The Chemical Age, Vol. VII., p. 651). The application of the process to lithographic inks, rosin varnish, and dyes is also described. Reference is directed in pursuance of Sect. 8, Sub-sect. 2 of the Patents and Designs Acts, 1907 and 1919, to specification 186,462.

198,071. Cracking Mineral Oil to Produce Gasoline, Apparatus for. B. Van Steenbergh, Goshen, Orange Co., N.Y., U.S.A. Application date, February 27, 1922.

Heavy mineral oil is preheated, sprayed over electrically heated surfaces coated with catalyst, and the uncracked portion then passed over a surface at higher temperature to crack it. The cracking chamber 5 is heat insulated, and is provided with horizontal electrically heated tubes 11. Vapour is drawn off through a pipe 6*a* to condensing coils 6*b*, 10, discharging into liquid seals 9*b*, 10*d*. The electric heaters consist of external iron tubes containing refractory tubes which are filled with granular carbon forming a resistance. The iron tubes are coated with a catalyst consisting of calcium or magnesium oxide mixed with dilute sodium silicate. A pump 22 draws oil from a reservoir 27 and water from a pipe 26 in the proportion of 4 : 1, and delivers the mixture through a pipe 23 to a tortuous pipe 20 in the cracking chamber. The preheated oil then passes through a pipe 24 to spray nozzles 21, 21*a*. The pump may deliver the mixture to a separate coil 41 to preheat or superheat it. The chamber 5 is maintained at 650°–850° F. by the electric heaters, and the mixture of oil and water is preheated to 1,000° F. The oil is vaporised and cracked in contact with the heating tubes 11, and hydrogen may also be admitted through the injector 21*b* to hydrogenate the oil. The lower group of heaters 11 may be heated to 1,800°–2,000° F. and sprayed with superheated oil and steam, which are cracked, so that little bituminous matter passes into the receiver 5*a*.

198,077. Vat Dyestuffs of the Anthraquinone Series. R. B. Ransford, London. From L. Cassella and Co., G.m.b.H., Frankfort-on-Main, Germany. Application date, February 27, 1922.

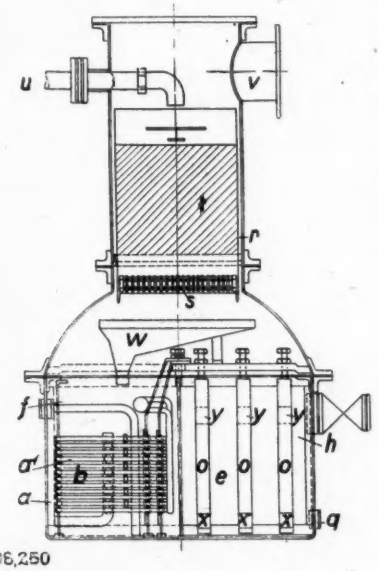
An azomethine compound derived from anthraquinone-2-aldehyde or a substitution product and an *o*-aminophenol, an *o*-aminothiophenol, or an equivalent, is condensed to form a vat dyestuff. The azomethine compounds need not be isolated, but the compounds from which they are produced may be mixed in molecular proportions and treated with a condensing agent. Equivalents of the *o*-aminothiophenols may be used, such as those derived from the action of disulphur dichloride on primary aromatic amino compounds and their products of transformation, the *o*-diaminoaryl-disulphides and *o*-aminoaryl thiosulphonic acids. The dyestuffs may also be obtained by condensing an anthraquinone-2-aldehyde or substitution product with a primary aromatic amino compound having one free ortho position to the amino group, and then heating the azomethine compound with sulphur. These dyestuffs of the oxazole and thiazole series which contain a number of oxazole and thiazole rings in the molecule are particularly valuable. Several examples of the preparation of the dyestuffs are given.

198,246. Anodes for Forming Percompounds. Chemische Fabrik Weissenstein Ges.m.b.H., and G. Baum, Weissenstein a-Drau, Carinthia, Austria. Application date, July 7, 1922.

In the production of percompounds by electrolysis, it has been found that an anode of platinum, or of tantalum completely coated with platinum is not necessary. The anode is only partly coated with platinum, either by welding or electrolysis, and the percompounds formed are not injuriously affected. Alternatively, an alloy of tantalum and platinum may be used.

198,250. Distilling Apparatus. H. Bollman, 1, Alsterdamm, Hamburg, Germany. Application date, July 11, 1922.

The apparatus is for continuously evaporating solutions, such as a mixture of benzol, alcohol and water containing the soluble constituents of oleaginous seeds. The lower part of the still *a* is divided into four quadrants by partitions such as *f*, *h*, each having a heating coil *a'*. These coils are heated to different temperatures, *e.g.*, 60° C., 70° C., 80° C., and 100° C. The solution is supplied through a pipe *u* and passes downwards through a dome *r* to a pan *w* and thence to a compartment *b*



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at the lowest temperature. Overflow pipes *o* are provided between the compartments, having inlets *x* and outlets *y*, and the extract, free from solvent, escapes finally at the outlet *q*. The vapour from each compartment passes upwards through a grating *s* and retarding device *t* to the outlet *v*.

Note.—Abstracts of the following specifications, which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention: 189,450 (Rheinische Kampfer-Fabrik Ges.) relating to the production of inactive menthol, see Vol. VIII., p. 127.

International Specifications not yet Accepted

196,601. Urea. Elektrizitätswerk Lonza, 72, Aeschenvorstadt, Basle, Switzerland. International Convention date, April 20, 1922.

A solution of cyanamide is added gradually to a mineral acid to avoid local heating, in the preparation of urea salts of mineral acids.

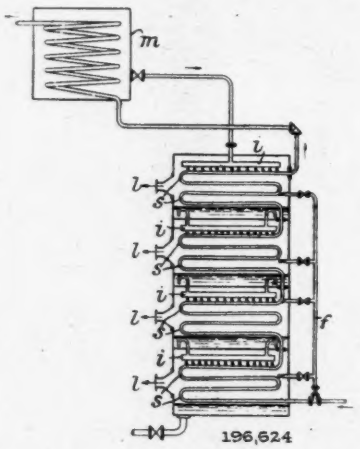
196,623. Fats and Fatty Oils. Chemische Fabrik Aspe, Kreis Rendsburg, Germany. International Convention date, April 22, 1922.

Low grade fish oils or other animal or vegetable oils are purified by distilling *in vacuo* or in methane or illuminating

gas, to expel those fatty acids, etc., volatile below the carbonising temperature of the oil (200°–300° C.). Fatty acids are separated from the distillate and used for tanning purposes, and the residual fats are used in soap manufacture, or they may be sulphonated.

196,624. DISTILLING PETROLEUM. Brünn-Konigsfelder Maschinenfabrik der Maschinen und Waggonbau-Fabriks Akt.-Ges. vorm. H. D. Schmid, Konigsfeld, near Brünn, Czecho-Slovakia, and K. Fuchs, Orsova, Czecho-Slovakia. International Convention date, April 22, 1922.

Petroleum is preheated in a tank *m* and distributed by a



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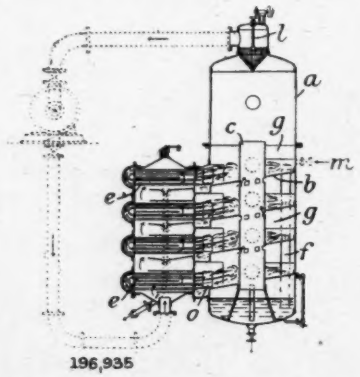
spreader *i* on a steam-heated coil *s*. Vapour is drawn off at the outlet *l* and the residue passes to a similar evaporating unit below, and so on. Superheated steam may be passed into the coil *s* from a pipe *f*, either in the same or the opposite direction to the flow of the oil.

196,922. CENTRIFUGAL SEPARATORS. R. Thayer, 916, Clinton Street, Philadelphia, Pa., U.S.A. International Convention date, May 1, 1922.

Metals are separated from metalliferous pulp in a centrifugal separator through which an electric current is passed to a mercury cathode. The separator bowl consists of a closed cylindrical casing mounted on a vertical shaft. The bowl contains an inverted cup slightly spaced from the outer walls, and insulated from them, and the cup and casing are connected to a source of current. Mercury forms a layer on the outer wall of the casing during rotation, and thus becomes the cathode. Metalliferous pulp is supplied to the vessel, and is subjected to centrifugal and electrical separation. The apparatus is suitable for separating gold, silver, platinum, iridium, etc.



196,935

196,935. CONCENTRATING LIQUIDS. W. Vogelbusch, 551, Lichtensteinstrasse, Vienna. International Convention date, April 28, 1922.

Caustic soda solution is supplied through the inlet *m* to a shelf *b*, over which it passes to the lower tubes of the upper heater *e* and then through the upper tubes to the opposite side of a radial partition *g*. Part of the solution overflows through a tube *f* to the shelf below, where the cycle is repeated, and so on. The vapour may be discharged through a pipe *c*, or the vapour from each shelf may pass into the solution on the shelf above. The tubes *e* may be steam-heated by compressing the evolved vapour and passing it into the bottom of the heater, or they may be heated by combustion gases.

196,938. REFINING TIN. T. Goldschmidt Akt.-Ges., L. Schertel, and W. Lüty, 18, Salkenbergsweg, Essen, Germany. International Convention date, April 29, 1922.

Sodium, calcium, zinc or aluminium is added to molten tin, and the mixture is then treated with an oxidising agent such as air or water. Impurities such as arsenic, antimony, and copper may then be removed as a scum which may be treated for the recovery of the metals.

LATEST NOTIFICATIONS.

199,354. Processes for the manufacture of diphenylguanidine. Naugatuck Chemical Co. June 19, 1922.

199,360. Manufacture of new dyestuffs of indigo tint. Society of Chemical Industry in Basle. June 13, 1922.

199,364. Process for the manufacture of hydrogen. L'Oxhydrique Française. June 17, 1922.

199,400. Process for the manufacture of the cardiac glucoside of bulbus scillæ. Chemische Fabrik vorm. Sandoz. June 17, 1922.

199,401. Reduction of dioxyperylene. Pereira, H. June 19, 1922.

Specifications Accepted, with Date of Application

191,000. Petrol and alcohol, Process for rendering soluble mixtures of. Soc. Ricard, Allenet, et Cie. December 28, 1921.

198,705. Oils, bituminous matter, tar, and resin from bituminous shale, oil bearing sands, bleaching earths, peat, brown coal, coal, and wood, Process and apparatus for the recovery of. Plausen's (Parent Co.), Ltd. (*H. Plauson*). December 2 1921.

198,706. Fats and fatty oils, Process for the purification of. F. Bedford. December 3, 1921.

198,777. Gas from coal and or other carbonaceous solids and/or materials, Process of the manufacture of. M. W. Travers and F. W. Clark. March 9, 1922.

198,800. Electric furnaces. L. W. Wild and E. P. Barfield. March 13, 1922.

198,829. Pyrazolone, Manufacture of a new derivative of and of new dyestuffs therefrom. O. Y. Imray (*Soc. of Chemical Industry in Basle*). March 22, 1922.

198,855. Chemical reactions, Apparatus for effecting—by means of amalgams. E. C. R. Marks (*Royal Baking Powder Co.*). April 3, 1922.

198,914. India-rubber or caoutchouc, Treatment of. C. Marter. June 20, 1922.

198,933. Electrodes and method of making same. J. P. Scott. July 25, 1922.

198,975. Chlorination of cellulose material, Processes for dissolving the organic products obtained by. A. R. de Vains. December 19, 1922. Addition to 189,561.

Applications for Patents

Aktiebolaget Separator. Centrifugal separators. 16,010. June 20. (Sweden, August 16, 1922.)

Aktiebolaget Separator. Centrifugal separators. 16,026. June 20. (Sweden, August 24, 1922.)

Calvert, G. Manufacture of substances containing a methyl radicle. 15,932. June 19.

Carpenter Chemical Co., Inc. Methods of treating silk. 16,009. June 20. (United States, June 21, 1922.)

Coley, H. E. Reduction of sulphides. 16,138, 16,139. June 21.

Dreyfus, H. Manufacture of aliphatic derivatives. 16,263. June 22.

Electro Metallurgical Co. Heat treated zirconium steel. 16,057. June 21. (United States, January 25.)

Elektrizitätswerk Lonza. Production of polymerization products of acetylene. 16,283. June 22. (Germany, June 30, 1922.)

Hyde, A. C., and Turner, W. L. Manufacture of iron manganese alloys. 16,068. June 21.

Kousnetzoff, A. I. Atomizing heavy hydrocarbons. 16,182. June 21.

Meulen, J. H. van der. Process of vulcanising oils or fats. 16,164. June 21. (Holland, July 31, 1922.)

Techno-Chemical Laboratories, Ltd. Ejector and injector compression or jet compressor apparatus for elastic fluid. 16,153. June 21.

Truttwin, H. Production of solutions of metal-iodide-alkali-iodide compounds for use in therapeutics. 15,876. June 19. (Germany, July 3, 1922.)

Zdanowich, J. O. Manufacture of cellulose acetates. 15,781. June 18.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

London, June 28, 1923.

THERE has been a steady market during the past week and the turnover, whilst far from satisfactory, is rather better than of late. Prices generally remain very firm.

There is considerable export enquiry, particularly for basic chemicals, but business materialises very slowly.

General Chemicals

ACETONE is higher in price and in good demand.

ACID ACETIC.—There is practically nothing available on the spot and price is firm in all positions.

ACID CITRIC.—Unchanged.

ACID FORMIC is in fair request at recent values.

ACID OXALIC is still very quiet—price is easier.

ACID TARTARIC.—The market is influenced by second-hand realisations, makers holding firmly to their price.

ACID LACTIC is in fair demand, price is firm.

ARSENIC is dearer, foreign makers having advanced their price.

BARIUM CHLORIDE is a falling market and in very poor demand.

BLEACHING POWDER is in good request on export account and the home trade is rather better.

CREAM OF TARTAR.—A fair business is reported and the price is decidedly firm.

FORMALDEHYDE is very scarce indeed. There is a substantial demand for spot delivery with makers well sold some distance ahead.

LEAD ACETATE is in good demand, very firm in tone.

POTASH, CAUSTIC is uninteresting.

POTASH CARBONATE.—Slow of sale and weak in tone.

POTASH PERMANGANATE is a small market with no change in price.

POTASH PRUSSIATE.—The fall in value seems to have been arrested. The demand is improving.

SODIUM ACETATE is very scarce indeed, makers being sold out until later months of the year.

SODIUM BICHROMATE.—Trade is in the hands of English makers who report a fair demand.

SODIUM NITRITE is in better inquiry and shows an upward tendency.

SODIUM PRUSSIATE.—After a falling market the price seems to be stabilised and in some directions an improvement is now looked for.

SODIUM SULPHIDE.—Unchanged.

ZINC OXIDE.—Unchanged.

Pharmaceutical Chemicals

EUCALYPTUS OIL.—Demand improving, but firm prices rule.

MILK SUGAR.—Cheaper offers still reported as a result of the collapse of the mark, but the demand continues slow.

PHENAZONE is a shade weaker, but good prices are obtainable for the best grades.

PHENOLPHTHALEIN.—In good demand and spot supplies are scarce. The forward price is maintained.

SALICYLIC ACID.—Displays a slightly weaker tendency in sympathy with phenol.

CALCIUM LACTATE B.A.—Price is well maintained and demand improving.

BROMIDES.—Cheap offers continue, but there is no great inquiry.

Coal Tar Intermediates

Home trade has been rather quiet during the last week, but the prices are maintained on the whole and the export market has received some interest.

ALPHA NAPHTHOL.—Home trade orders have been booked and spot stocks are very short.

ALPHA NAPHTHALAMINE is steady and some inquiry is in the market.

ANILINE OIL continues to pass regularly into consumption at last quoted values.

BENZILINE BASE is quite firm and has been the object of interest both on home and export account.

GAMMA ACID.—Export orders have been booked.

" G " SALT has been slightly more interesting.

" H " ACID.—Firm spot and home buyers are in the market.

NAPHTHIONIC ACID.—Both export and home orders have been received.

RESORCINE.—A fair inquiry is about.

Coal Tar Products

There is no great change in the position of Coal Tar Products since last week. Prices remain fairly steady, but at the same time, there is no great activity apparent.

90 % BENZOL is steady at 1s. 7d. per gallon on rails.

PURE BENZOL is in poor demand, and is quoted at 2s. 1d. per gallon on rails in the North, and 2s. 4d. to 2s. 5d. per gallon in London.

CREOSOTE OIL is slightly more active for the near position, and is worth 8¼d. to 8½d. per gallon in the North, and 9d. to 9¼d. per gallon in the South.

CRESYLIC ACID has a moderate inquiry, and is worth about 2s. 1d. per gallon on rails for the pale quality, 97/99%, while the dark quality, 95/97%, is worth about 1s. 10d. per gallon on rails.

SOLVENT NAPHTHA is quoted at the nominal price of 1s. 4d. per gallon, but there is little business passing.

HEAVY NAPHTHA is also quiet at 1s. 6d. per gallon.

NAPHTHALENES are weak, the lower qualities being worth from £6 10s. to £7, while the better qualities are quoted at £9 10s. to £10 10s. per ton.

PITCH remains firm, and prices have again advanced, to-day's quotations are 130s. to 135s. f.o.b. London, 125s. to 130s. f.o.b. East Coast.

Sulphate of Ammonia

Is unchanged, and there is little demand for Home trade, but the epoxrt demand is satisfactory.

[*Current Market Prices on following pages.*]

Lead as a Material for Chemical Equipment

THE use of lead for certain chemical plant is well known, and is further considered in a recent paper by Mr. G. O. Hiers, of the American Chemical Society. Chemical lead is a term that has been used for many years in the trade to describe undesilverised lead produced from certain American ores. This lead contains from 0·04 per cent. to 0·08 per cent. of copper, from 0·005 per cent. to 0·015 per cent. (1½ to 4½ oz. per ton) of silver and carries less than 0·005 per cent. bismuth. It is the variety used almost entirely in chemical equipment in the U.S.A., principally in the sulphuric acid manufacture and in the diverse industries using sulphuric acid. Sulphuric acid ranging in strength up to 77·67 per cent. H_2SO_4 has but slight action upon lead even when heated to near the boiling point. When more concentrated up to 96 per cent. the action is still only slight in the cold but increases with rising temperatures. Lead is used in the forms of sheets for tank linings and pipes for conveying liquids and making heating coils. Hard lead (containing about 8 per cent. antimony), on account of superior strength, is used to some extent, but it cannot resist the action of concentrated sulphuric acid above 200° C. Lead covered and lined steel tanks, drums, pipes, valves, pumps, etc., are now being widely used.

Current Market Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride, 90–95%	lb.	0	1	4	to	0	1	5
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	122	10	0	to	125	0	0
Acid, Acetic, glacial, 99–100%	ton	69	0	0	to	70	0	0
Acetic, 80% pure	ton	50	0	0	to	51	0	0
Acetic, 40% pure	ton	25	0	0	to	26	0	0
Arsenic, liquid, 2000 s.g.	ton	88	0	0	to	90	0	0
Boric, commercial	ton	50	0	0	to	55	0	0
Carbolic, cryst. 39–40%	lb.	0	1	8	to	0	1	9
Citric	lb.	0	1	10	to	0	1	10½
Formic, 80%	ton	50	0	0	to	51	0	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	41	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	44	0	0
Nitric, 80 Tw.	ton	27	0	0	to	28	0	0
Oxalic	lb.	0	0	6½	to	0	0	6¾
Phosphoric, 1.5	ton	35	0	0	to	38	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, Technical	lb.	0	1	9	to	0	2	0
Sulphuric, 92–93%	ton	6	0	0	to	7	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	5	to	0	1	5½
Alum, lump	ton	12	10	0	to	13	0	0
Chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	7	0	0	to	7	5	0
Aluminium, sulphate, 14–15%	ton	8	10	0	to	9	0	0
Sulphate, 17–18%	ton	10	10	0	to	11	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8
.880	ton	32	0	0	to	34	0	0
.920	ton	22	0	0	to	24	0	0
Carbonate	ton	32	15	0			—	
Chloride	ton	50	0	0	to	55	0	0
Muriate (galvanisers)	ton	35	0	0	to	37	10	0
Nitrate (pure)	ton	35	0	0	to	40	0	0
Phosphate	ton	68	0	0	to	70	0	0
Sulphocyanide, commercial 90%	lb.	0	1	1	to	0	1	3
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white powdered	ton	73	0	0	to	75	0	0
Barium, carbonate, Witherite	ton	5	0	0	to	6	0	0
Carbonate, Precip.	ton	15	0	0	to	16	0	0
Chlorate	ton	65	0	0	to	70	0	0
Chloride	ton	16	0	0	to	16	10	0
Nitrate	ton	33	0	0	to	35	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	0	11	to	0	1	0
Bleaching powder, 35–37%	ton	10	10	0	to	11	0	0
Borax crystals	ton	27	0	0	to		—	
Calcium acetate, Brown	ton	11	10	0	to	12	0	0
Grey	ton	19	15	0	to	20	0	0
Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	5	15	0	to	6	0	0
Carbon bisulphide	ton	35	0	0	to	40	0	0
Casein technical	ton	100	0	0	to	105	0	0
Cerium oxalate	lb.	0	3	0	to	0	3	6
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	1	to	0	1	2
Sulphate	ton	27	0	0	to	28	0	0
Cream Tartar, 98–100%	ton	97	10	0	to	100	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	94	0	0	to	95	0	0
Formusol (Rongalite)	lb.	0	2	1	to	0	2	2
Glauber salts, commercial	ton	5	0	0	to	5	10	0
Glycerin crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal	0	2	2	to	0	2	3
Iron perchloride	ton	28	0	0	to	30	0	0
Sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	43	0	0	to	45	0	0
Carbonate (White Lead)	ton	45	0	0	to	48	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	39	0	0	to	40	0	0
Lithophone, 30%	ton	22	10	0	to	23	0	0
Magnesium chloride	ton	4	7	6	to	4	10	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	6	10	0	to	7	0	0
Sulphate (Druggists')	ton	10	0	0	to	11	0	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	50	0	0	to	55	0	0
Methyl acetone	ton	78	0	0	to	80	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	39	0	0	to	40	0	0
Ammonium sulphate, double salt	ton	39	0	0	to	40	0	0

	Per	£	s.	d.		£	s.	d.
Potash, Caustic	ton	35	0	0	to	36	0	0
Potassium bichromate	lb.	0	0	5¾	to	0	0	6
Carbonate, 90%	ton	31	0	0	to	32	0	0
Chloride, 80%	ton	9	0	0	to	10	0	0
Chlorate	lb.	0	0	4	to	0	0	4½
Metabisulphite, 50–52%	ton	75	0	0	to	80	0	0
Nitrate, refined	ton	43	0	0	to	45	0	0
Permanganate	lb.	0	0	10½	to	0	0	11
Prussiate, red	lb.	0	3	3	to	0	3	6
Prussiate, yellow	lb.	0	1	4½	to	0	1	5
Sulphate, 90%	ton	10	10	0	to	11	0	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	25	0	0	to	25	10	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4½	to	0	0	4¾
Bisulphite, 60–62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	3½	to	0	0	3½
Caustic, 70%	ton	19	10	0	to	20	0	0
Caustic, 76%	ton	20	10	0	to	21	0	0
Hydrosulphite, powder	lb.	0	1	5	to	0	1	6
Hyposulphite, commercial	ton	10	10	0	to	11	0	0
Nitrite, 96–98%	ton	27	10	0	to	28	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	1	0	to	0	1	1
Prussiate	lb.	0	0	7¾	to	0	0	8
Sulphide, crystals	ton	10	10	0	to	11	0	0
Sulphide, solid, 60–62 %	ton	16	10	0	to	17	10	0
Sulphite, cryst.	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	50	0	0	to	55	0	0
Nitrate	ton	50	0	0	to	55	0	0
Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Flowers	ton	11	10	0	to	12	10	0
Roll	ton	11	0	0	to	12	0	0
Tartar emetic	lb.	0	1	2	to	0	1	3
Tin perchloride, 33%	lb.	0	1	1	to	0	1	2
Perchloride, solid	lb.	0	1	3	to	0	1	4
Protochloride (tin crystals)	lb.	0	1	4	to	0	1	5
Zinc chloride 102° Tw.	ton	20	0	0	to	21	0	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	50	0	0	to	52	0	0
Dust, 90%	ton	50	0	0	to	55	0	0
Sulphate	ton	16	0	0	to	17	0	0

Pharmaceutical Chemicals

Acetyl salicylic acid	lb.	0	3	3	to	0	3	6
Acetanilid	lb.	0	1	6	to	0	1	9
Acid, Gallic, pure	lb.	0	3	0	to	0	3	3
Lactic, 1.21	lb.	0	2	3	to	0	2	9
Salicylic, B.P.	lb.	0	2	1½	to	0	2	4
Tannic, leviss.	lb.	0	3	3	to	0	3	6
Amidol	lb.	0	7	9	to	0	8	3
Amidopyrin	lb.	0	13	0	to	0	13	3
Ammon ichthosulphonate	lb	0	1	11	to	0	2	2
Barbitone	lb.	1	1	0	to	1	3	0
Beta naphthol resublimed	lb	0	1	9	to	0	2	0
Bromide of ammonia	lb.	0	0	8	to	0	0	9
Potash	lb.	0	0	7	to	0	0	8
Soda	lb.	0	0	7½	to	0	0	8½
Caffeine, pure	lb.	0	11	0	to	0	11	6
Calcium glycerophosphate	lb.	0	5	9	to	0	6	0
Lactate	lb.	0	1	10	to	0	2	0
Calomel	lb.	0	4	9	to	0	5	0
Chloral hydrate	lb.	0	3	10½	to	0	4	0
Cocaine alkaloid	oz.	0	18	0	to	0	18	6
Hydrochloride	oz.	0	14	9	to	0	15	0
Corrosive sublimate	lb.	0	4	3	to	0	4	6
Eucalyptus oil, B.P. (70–75% eucalyptol)	lb.	0	1	10	to	0	1	11
B.P. (75–80% eucalyptol)	lb.	0	1	11	to	0	2	0
Guaiacol carbonate	lb.	0	8	9	to	0	9	0
Liquid	lb.	0	9	6	to	0	10	0
Pure crystals	lb.	0	10	3	to	0	10	6
Hexamine	lb.	0	3	11	to	0	4	1
Hydroquinone	lb.	0	3	6	to	0	3	9
Lanoline anhydrous	lb.	0	0	7	to	0	0	7½
Lecithin ex ovo	lb.	0	17	6	to	0	19	0
Lithi carbonate	lb.	0	9	6	to	0	10	0
Methyl salicylate	lb.	0	2	5	to	0	2	8
Metol	lb.	0	10	6	to	0	11	6
Milk sugar	cwt.	4	2	6	to	4	5	0
Paraldehyde	lb.	0	1	6	to	0	1	9
Phenacetin	lb.	0	6	4	to	0	6	6
Phenazone	lb.	0	7	4	to	0	7	7
Phenolphthalein	lb.	0	6	6	to	0	6	9
Potassium sulpho guaiacolate	lb.	0	5	0	to	0	5	3
Quinine sulphate, B.P.	oz.	0	2	3			—	

	Per	£	s.	d.		£	s.	d.
Resorcin, medicinal	lb.	0	5	6	to	0	5	9
Salicylate of soda powder	lb.	0	2	6	to	0	2	9
Crystals	lb.	0	2	9	to	0	3	0
Salol	lb.	0	2	9	to	0	3	0
Soda Benzoate	lb.	0	2	6	to	0	2	9
Sulphonal	lb.	0	14	6	to	0	15	0
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	10	6	to	0	11	0
Soda salicylate	lb.	0	7	9	to	0	8	3
Vanillin	lb.	1	3	6	to	1	4	6

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	2	0	to	0	2	3
Refined	lb.	0	2	6	to	0	2	9
Alphanaphthylamine	lb.	0	1	6	to	0	1	7
Aniline oil, drums extra	lb.	0	0	9	to	0	0	9½
Salts	lb.	0	0	9½	to	0	0	10
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	0	to	0	3	3
Benzidine, base	lb.	0	4	9	to	0	5	0
Sulphate	lb.	0	3	9	to	0	4	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	1	to	0	1	2
Betanaphthylamine, technical	lb.	0	4	0	to	0	4	3
Croceine Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	4	6	to	0	4	9
Dinitrobenzol	lb.	0	1	1	to	0	1	2
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	4	to	0	1	5
Dinitrophenol	lb.	0	1	6	to	0	1	7
Dimethylaniline	lb.	0	3	0	to	0	3	3
Diphenylamine	lb.	0	3	6	to	0	3	9
H-Acid	lb.	0	5	0	to	0	5	3
Metaphenylenediamine	lb.	0	4	0	to	0	4	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	0	to	0	4	3
Monosulphonic Acid (2.7)	lb.	0	7	6	to	0	8	6
Naphthionic acid, crude	lb.	0	2	3	to	0	2	6
Naphthionate of Soda	lb.	0	2	6	to	0	2	9
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Nevill Winther Acid	lb.	0	7	3	to	0	7	9
Nitrobenzol	lb.	0	0	7	to	0	0	8
Nitronaphthalene	lb.	0	0	11½	to	0	1	0
Nitrotoluol	lb.	0	0	8	to	0	0	9
Orthoamidophenol base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	0	10	to	0	0	11
Orthonitrotoluol	lb.	0	0	3	to	0	0	4
Para-amidophenol, base	lb.	0	8	6	to	0	9	0
Hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	2	7	to	0	2	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	2	9	to	0	3	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	12	6
Paratoluidine	lb.	0	5	9	to	0	6	3
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcin, technical	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	0	10	to	0	0	11
Tolidine, base	lb.	0	7	3	to	0	7	9
Mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

Essential Oils.		£	s.	d.
Anise	c.i.f. 1/10 spot	0	2	0
Bay		0	12	0
Bergamot		0	12	0
Cajaput		0	3	9
Camphor, white	per cwt.	4	0	0
Brown	„	3	15	0
Cassia	dearer and scarce. c.i.f. 10/6 spot	0	12	0
Cedarwood		0	1	4½
Citronella (Ceylon)	scarce and firm on spot	0	3	9
(Java)	„ „ „	0	4	2
Clove		0	6	9
Eucalyptus	firm	0	1	9
Geranium Bourbon		1	10	0
Lavender		0	12	6
Lavender spike		0	3	0
Lemon		0	3	0
Lemongrass	per oz.	0	0	2½
Lime (distilled)		0	4	0
Orange sweet (Sicilian)		0	13	6
(West Indian)		0	10	6
Palmarosa		0	19	0
Peppermint (American)	firmer	0	13	0
Mint (dementholised Japanese)	dearer	0	7	0
Patchouli		1	12	0
Otto of Rose	per oz.	1	4	0
Rosemary		0	1	8
Sandalwood		1	6	0
Sassafras		0	5	3
Thyme	2/6 to	0	8	0

Synthetics.			
Benzyl acetate	0	3	0
Benzoate	0	3	0
Citral	0	10	0
Coumarine	0	18	6
Heliotropine	0	7	6
Ionone	1	5	0
Linalyl acetate	1	2	6
Methyl salicylate	0	2	6
Musk xylol	0	10	6
Terpeniol	0	3	1

The Chemists' Exhibition

THE Chemists' Exhibition, which opened on June 18, at the Central Hall, Westminster, closed on Friday last, June 22. Allen and Hanburys, Ltd., showed bottles of insulin, and the apparatus and solutions required for the estimation of blood sugar. There was an interesting exhibit of the various glands used in the preparation of the organo-therapeutic products of the company. The Anglo-American Oil Co., Ltd., had a display of paraffin preparations, among which Nujol was conspicuous. The British Alkaloids, Ltd., had their special antiseptics on view, including an exhibit of their T.C.P., which is said to possess the essentials of a perfect antiseptic. British Colloids, Ltd., who have added Colosol Kalolin to their list of colloidal preparations, also showed their older colloids, and a special spray for iodine oil. Howards and Sons, Ltd., displayed some fine specimens of drugs, such as cinchona; their standard ether was also on show, and prominence was given to Avantine, their brand of isopropyl alcohol. The International Chemical Co. exhibited bisurated magnesia and bitro phosphate, etc. Charles Zimmerman and Co., who gave exhibits of chocolate confection containing half-a-grain of colloidal iron, also showed Idozan, a colloidal iron, used for toilet purposes. Jeyes' sanitary compounds were also on view. W. J. Bush and Co. had several stands; the Chemical side of the company was represented by specimens of concentrated flower and essential oils, vanillin, thymol, cream of tartar, and salicylates. Saltrates, Ltd., displayed their well-known products, including Kal-sel, Nemolin and their saltrates. Other exhibitors included A. Connell and Co. (toilet preparations, perfumes, etc.), and the Viscose Development Co. (bottle caps).

Catalogues Received

AUTOMATIC AND ELECTRIC FURNACES, LTD.—We have received from the above firm, of 173-5, Farringdon Road London, E.C.1, a folder showing the use of automatically regulated electric furnaces in the hardening of tools. The Wild-Barfield furnace is particularly suited to this kind of work owing to the certainty with which a given temperature can be repeated.

BUTTERWORTH BROS., LTD.—We have received from this firm from the Newton Heath Glass Works, Manchester, a catalogue of various glass instruments such as steam gauge glasses, lubricator sight glasses, and specia lasses of various kinds for use in connection with machinery. In addition there are included various accessories, such as glass cutters, which will be of considerable use to chemists.

EMPIRE ROLLER BEARING CO. (1923), LTD.—An excellent little catalogue is issued by this firm, of Empire Works, Bradford, giving particulars and dimensions of various types of roller bearings suitable for shafting, trucks, and other industrial machinery. It may be pointed out in this connection that while ball bearings are universally recognised as being of great advantage in reducing friction and improving effieiency, the use of roller bearings with comparable advantages for heavier work is often neglected. A speciality of the firm is a split type of bearing which has the advantage of rapid assembly.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

Glasgow, June 27, 1923.

BUSINESS continues quiet, with only a very moderate amount booked during the past week.

Continental offers are numerous, and prices, if anything, a little lower than a week ago. Quotations for spot material, however, remain fairly steady.

Industrial Chemicals

ACID, ACETIC.—Glacial, 98/100%, £60 to £69 per ton; 80% pure, £49 to £50 per ton; 80% technical, £44 to £47 per ton, c.i.f. U.K. duty free.

ACID, BORACIC.—Crystal or granulated, £50 per ton; powdered, £52 per ton, carriage paid U.K. stations, minimum ton lots.

ACID, CARBOLIC (ICE CRYSTALS).—Quoted 1s. 4d. per lb., but could probably be obtained at less.

ACID, CITRIC.—About 1s. 8d. per lb.

ACID, FORMIC 80%.—Unchanged at about £50 per ton, ex wharf.

ACID, HYDROCHLORIC.—In little demand, 6s. 6d. per carboy, ex works.

ACID, NITRIC 80°.—£24 per ton, ex station, full truck loads.

ACID, OXALIC.—Spot lots about 6d. per lb.

ACID, SULPHURIC.—144°, £3 15s. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality, 20s. per ton more.

ACID, TARTARIC.—Offered at 1s. 2¾d., less 5 per cent. ex store.

ALUM, LUMP, POTASH.—Offered from Continent at £8 15s. per ton, c.i.f. U.K. Spot lots about £11 per ton, ex wharf.

ALUMINA, SULPHATE.—17/18%, £10 10s. per ton; 14/15%, £7 10s. per ton, ex wharf, early delivery.

AMMONIA, ANHYDROUS.—Unchanged at 1s. 5½d. per lb., ex station.

AMMONIA, CARBONATE.—Lump, 4d. per lb.; ground, 4¼d. per lb. delivered.

AMMONIA LIQUID 880°.—Unchanged at about 3½d. per lb. ex station, containers extra.

AMMONIA MURIATE.—Galvanisers, grey quality, unchanged at about £32 per ton. Fine white crystals quoted £24 per ton ex wharf, early delivery.

AMMONIA SULPHATE.—25¼%, £15 10s. per ton; 25¾% neutral, £16 13s. per ton, ex works, June delivery.

ARSENIC, WHITE POWDERED.—Now quoted £76 per ton, ex wharf, spot delivery.

BARIUM CHLORIDE 98/100%.—Offered from Continent at £12 5s. per ton, c.i.f. U.K. Spot lots about £14 to £15 per ton, ex store.

BARYTES.—Finest white English, £5 5s. per ton, ex works.

BLEACHING POWDER.—£11 7s. 6d. per ton, ex station, spot delivery. Contracts, 20s. per ton less.

BORAX.—Granulated, £26 10s. per ton; crystal, £27 per ton; powdered, £28 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English makers' price unchanged, £5 12s. 6d. per ton, ex quay or station. Continental make, £4 per ton, c.i.f. U.K.

COPPER SULPHATE.—Quoted £26 10s., less 5% f.o.b. Liverpool. Little inquiry.

COPPERAS, GREEN.—Now offered at £2 2s. 6d. per ton, f.o.b. U.K.

FORMALDEHYDE 40%.—Unchanged at about £92 per ton for spot material. Quoted £87 per ton, ex wharf, early shipment.

GLAUBER SALTS.—Fine white crystals, £3 15s. per ton, ex store.

LEAD, RED.—English, £41 per ton, carriage paid U.K. stations. Continental material about £36 to £37 per ton, ex store.

LEAD ACETATE.—Unchanged at £44 per ton, ex store, spot delivery. Offered from Continent at £41 per ton, c.i.f. U.K. ports.

MAGNESITE, GROUND CALCINED.—English ground at £8 5s. to £8 10s. per ton, ex station. Continental about £7 5s. per ton, c.i.f. U.K. ports.

MAGNESIUM CHLORIDE.—Offered at £1 10s. per ton, c.i.f. U.K. Spot lots, £2 10s. to £3 per ton, ex store.

MAGNESIUM SULPHATE (Epsom Salts).—Commercial quality £7 per ton; B.P. quality, £8 5s. per ton, ex station.

POTASH, CAUSTIC.—Quoted £29 10s. per ton, c.i.f. U.K. Spot lots about £32 per ton, ex store.

POTASSIUM BICHROMATE.—Unchanged at 5¾d. per lb. delivered.

POTASSIUM CARBONATE.—96/98% offered at £29 per ton, c.i.f. U.K.; 90/92%, £26 5s. per ton, c.i.f. U.K. Spot lots about £32 and £27 per ton respectively.

POTASSIUM CHLORATE.—Unchanged at 3d. per lb., ex store, crystals or powdered.

POTASSIUM NITRATE (SALTPETRE).—Offered at £25 5s., f.o.b. Continental port. Spot lots nominally £32 per ton.

POTASSIUM PERMANGANATE.—B.P. crystals, quoted 10½d. per lb., ex store.

POTASSIUM, PRUSSIATE YELLOW.—Unchanged at about 1s. 4d. per lb.

SODA, CAUSTIC.—76/77%, £21 7s. 6d. per ton; 70/72%, £19 17s. 6d. per ton; 60/62% broken, £21 2s. 6d. per ton; 98/99% powdered, £24 15s. per ton, all ex station, spot delivery.

SODIUM ACETATE.—Now quoted £25 per ton, ex wharf, early delivery.

SODIUM, BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station. M.W. quality, 30s. per ton less.

SODIUM, BICHROMATE.—Unchanged at 4¼d. per lb., delivered.

SODIUM CARBONATE.—Soda crystals, £5 to £5 5s. per ton, ex quay or station; alkali, £8 16s. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—Commercial crystals offered at £8 5s. per ton, c.i.f. U.K. Spot lots about £9 15s. per ton, ex wharf. Pea crystals, quoted £15 10s. per ton, ex store.

SODIUM NITRATE.—Refined 96/98% quality, £13 7s. 6d. per ton, f.o.r. or f.o.b. U.K.

SODIUM PRUSSIATE (YELLOW).—Unchanged at 7d. per lb., c.i.f. U.K.

SODIUM SULPHATE (SALTCAKE 95%).—£4 per ton, ex station, for home consumption. Higher prices for export.

SODIUM SULPHIDE 60/62%.—Offered from Continent at £12 per ton, c.i.f. U.K.

SULPHUR.—Flowers, £10 per ton; roll, £9 per ton; rock, £9 per ton; ground, £8 per ton. Prices nominal.

TIN, CRYSTALS.—Unchanged at 1s. 4d. per lb.

ZINC CHLORIDE.—98/100%, solid about £22 per ton, c.i.f. U.K.

ZINC SULPHATE.—Commercial crystals offered at £11 per ton, ex store.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ALPHA NAPHTHYLAMINE.—Export inquiry. Price quoted 1s. 6½d. per lb., f.o.b.

BETA NAPHTHOL.—Small inquiry. Price 1s. 2d. per lb., delivered.

DINITROCHLORBENZOL.—Inquiries for export. Price £95 per ton, f.o.b., drums included.

ETHYL BENZYL ANILINE.—Small home inquiry. Price 8s. per lb., returnable packages.

GAMMA ACID.—Small export inquiry. Price quoted 12s. 7d. per lb., 100% basis, f.o.b.

NAPHTHIONATE OF SODA.—Home inquiry. Price quoted 2s. 8½d. per lb., 100% basis, delivered.

PARANITRANILINE.—Small home inquiry. Price 2s. 7d. per lb., delivered.

Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, June 28, 1923.

The prospects of the home consumption branch of the chemical trade have not been improved by the decision of the Master Cotton Spinners' Federation this week to recommend additional short-time working during the next two months The consumption of chemicals in the cotton trade, normally a very large buyer, has been at a very low ebb for some considerable time, and if the recommendation is put into operation the position will become worse. Fortunately, the paper trade and the iron and steel industries are taking fair quantities, and are thus helping to create a certain degree of activity in the market, but business on the whole cannot be described as other than quiet.

Heavy Chemicals

Sodium sulphide keeps quiet but steady at £14 10s. per ton for 60–65 per cent. concentrated solid and £8 10s. per ton for crystals. Caustic soda is moving fairly briskly on home and foreign account, prices being maintained at from £19 for 60 per cent. to £21 10s. per ton for 76–77 per cent. material. Bleaching powder is also reasonably active for both branches of the trade, home consumption prices being steady at £11 7s. 6d. per ton. Glauber salts are unchanged at £4 per ton, with the demand still inactive. Soda crystals are rather quiet at £5 5s. per ton delivered. Saltcake is in good inquiry, and with supplies for near delivery on the short side prices are firm at about £4 10s. per ton. The home and foreign demand for alkali keeps up, and prices are steady at £7 12s. 6d. per ton for 58 per cent. material. Bicarbonate of soda is being steadily called for at £10 10s. per ton delivered to home consumers. Hyposulphite of soda is rather a dull section of the market, and photographic crystals are easier at £14 10s. per ton, with commercial on offer at £10. Nitrate of soda is firm on continued scarcity at £26 10s. to £27 per ton. Phosphate of soda meets with a very quiet demand at £14 to £14 10s. per ton. Chlorate of soda is steady and in moderate inquiry at 2¾d. per lb. Prussiate of soda keeps quiet and weaker at 7d. per lb. Bichromate of soda is in fair demand at 4½d. per lb. Acetate of soda is unchanged at £25 per ton, with supplies rather short and demand steady.

Caustic potash is quieter and easier at £31 per ton for 88–90 per cent. material. Carbonate of potash is quoted at about £31 per ton for 96–98 per cent. and £29 for 90–92 per cent. Bichromate of potash is in moderate request at 5¾d. per lb. The demand for yellow prussiate of potash shows little improvement, but prices are unaltered from last week at 1s. 3½d. per lb. Chlorate of potash is firm and in steady demand at 3d. per lb. Permanganate of potash is rather quiet but steady at 9¾d. to 10d. per lb.

Sulphate of copper finds only a moderately active market, though prices are maintained at between £26 and £26 10s. per ton, f.o.b. Arsenic is firm at £74 per ton for white powdered, Cornish makes, offers still being on a restricted scale; foreign brands are obtainable at lower rates. Commercial Epsom salts, British makes, are in moderate request at £5 10s. to £6 per ton. Acetate of lime keeps scarce at £21 for grey and £11 10s. per ton for brown. Nitrate of lead is quiet but steady at £42 to £43 per ton. Sugar of lead is scarce and firm at £41 to £42 for both brown and white.

Acids and Tar Products

Tartaric and citric acids meet with only a moderate inquiry, though prices are firm in both cases; tartaric is quoted at 1s. 3½d. and citric, B.P. crystals, 1s. 8½d. per lb. Oxalic acid is still inactive at 6d. to 6½d. per lb. Acetic acid is firm, glacial at £70 and 80 per cent. technical at £47 to £48 per ton.

Pitch is being inquired for for next season's delivery, and prices, though nominal, are said to be firmer at £6 to £6 10s. per ton, f.o.b. Carbolic acid crystals are very quiet at 1s. 4d. to 1s. 5d. per lb., with crude on offer at the unchanged quotation of 3s. 6d. per gallon. Benzol is in fair demand at 1s. 7d. to 1s. 8d. per gallon. Creosote oil is firmer at 9d. to 10d. per gallon. The demand for naphthalene is maintained at steady prices; flake is still quoted at about £20 per ton, and rude at £7 to £13.

German Trade and Industry in May

The Commercial Secretary at Berlin (Mr. F. Thelwall) has forwarded to the Department of Overseas Trade the following information based on reports of the Prussian Chambers of Commerce on German trade and industry during May:—

In spite of the unfavourable general situation, there was a not inconsiderable improvement in business in many branches of industry. The special feature in trade was the rise of the dollar, which again led to an increased desire to purchase on the part of inland customers, while foreign sales improved in consequence of the greater span between prices and of the easier export conditions. On the whole, German industry also benefited by the altered conditions, although, in view of the general situation, its outlook for the future continues melancholy. New difficulties arose in procuring British coal the import of which, owing to the depreciation of the mark, had, of course, to be restricted. The coal stocks had, therefore, to be broken into to a larger extent. In occupied territory the Communist strike, however unfavourable its effect from a political point of view, did not greatly affect the industrial situation. In unoccupied Germany also, as a result of the rise in prices amounting to 33·8 per cent. as compared with April, new wage demands were made, but practically without exception no friction arose. The few strikes which occurred were of a political character.

Potash

In the potash industry, inland trade had at first to suffer from considerable difficulties. The freight reductions for the summer introduced by the German Potash Syndicate led, however, to a substantial improvement of sales in the second half of May. By the summer reductions, the potash industry gave agriculture, as in the previous year, the opportunity of covering during the summer months a considerable portion of its autumn requirements at reduced freights. Foreign business also became lively on the renewed depreciation of the mark and exportation took place, particularly to America. Alsatian competition made itself increasingly felt in foreign trade. Coal deliveries left nothing to be desired. The truck supply was less satisfactory (Halberstadt).

Chemical Industry

The chemical preparations industry still suffered at the beginning of the month under the prevailing disinclination to buy. On the rise of the dollar, business revived on a continually increasing scale. Many orders from abroad were also received, so that at present the degree of employment is comparatively favourable. Practically no benefit accrued to the works from the new export facilities, as the reduction of the export duty did not go nearly far enough (Görlitz).

Cement

In the cement industry orders ceased almost completely in the middle of May, so that factories had to resort to a considerable restriction of production, to dismissals of workmen, and to shorter working hours. With the unusually high costs of production, work for stock would be beyond the financial capacity of the factories. The present position is rendered difficult by the circumstance that in the course of the winter a large number of dealers and customers secured large quantities of cement and entered the new year with considerable stocks. Shipments have been at an almost complete standstill since the beginning of April, and railway consignments decreased daily to a few wagons (Berlin).

Nitrostarch

The use of nitrostarch in the manufacture of safety explosives is increasing, and this substance is now important in the explosives industry, state C. A. Taylor and W. H. Rinkenbach, assistant explosives chemists of the American Department of the Interior, who have conducted a series of studies of the materials, constitution, and analysis of numerous types of explosives, at the Pittsburgh experiment station of the Bureau of Mines. Nitrostarch is made by nitrating starches with a mixture of sulphuric acid and nitric acid, details of the method varying considerably among different manufacturers. Commercial nitrostarch is in reality a mixture of compounds of various degrees of nitration, being comparable in this respect with nitrocellulose. Like the latter, nitorstarch is not a true nitro compound, being an organic nitrate.

Company News

RECKITT AND SONS, LTD.—The directors announce an interim dividend of 8d. per share, less tax, on the ordinary shares, for the quarter, payable on July 2.

BRITISH OXYGEN CO.—A final dividend is announced at the rate of 1s. 9d. per share, free of tax, payable on July 12 to shareholders registered July 2, making 12½ per cent., free of tax, for the year.

MAGADI SODA CO., LTD.—At a meeting held on June 18, a poll taken in respect to the four resolutions submitted to the shareholders resulted in the board's majority before the poll of 83,608 votes being increased to 109,958 votes.

THE NITRATE RAILWAYS CO., LTD.—The transfer books were closed on June 27, and will remain closed until July 10, both days inclusive. At a meeting of the directors held on June 27 it was decided that no dividend be recommended for the year 1922. The annual meeting of the shareholders will be held on July 10 next.

MONTREAL WATER AND POWER.—The report for the year to April 30 states that the gross earnings show an increase over 1922 of $75,000. After providing for bad debts, etc., there is a net profit of $146,000. The depreciation fund now stands at approximately $1,400,000, while the balance at profit and loss account has been increased to $648,000.

BLEACHERS' ASSOCIATION.—Presiding at Manchester, on Friday, June 22, at the annual meeting of the Association, Sir Alan J. Sykes said that whilst congratulating the shareholders on the satisfactory year he would refrain from prophesying as to the future. Their trade was dependent on the world's markets, and these at the moment were largely influenced by the unstable political condition. He gave the assurance that they were keeping their works in first-class order, and were prepared for their full share of any trade revival that came along.

ANTOFOGASTA NITRATE CO.—The net profit for the year 1922 amounted to $9,896,871. The directors propose to rebate interests charged to oficina " José Francisco Vergara " $1,223,684, transfer to reserve $800,000, to amortisation of oficinas fund $1,177,243, transferring to contingencies fund $1,324,451, and providing for scrip dividend made in July, 1922, $1,351,492, for dividend No. 146 $1,920,000, and for dividend No. 147 $2,400,000. The sum of $2,523,916 has been taken from the contingencies fund to cover surveys made during the year and to write off total expenses of closing down.

BRITISH BURMAH PETROLEUM CO., LTD.—The directors have declared an interim dividend at the rate of 6¼ per cent. per annum, free of tax, payable on July 16 to shareholders on the books on July 2, in respect of the profits for the six months of the current financial year. The directors state that the company's profits for the six months to January 31 last compare favourably with those of the corresponding period of last year, but the strike on the part of the Burmese drilling and production staffs is so seriously interfering with field operations that the profits for the current half-year are likely to show a considerable reduction.

DISTILLERS' CO., LTD.—The directors announce a final dividend on the ordinary shares of 12s. per share, free of tax, making 10 per cent. for the year ended May 15 last; £200,000 is placed to reserve, £30,000 to superannuation and provident fund, £5,000 to fire insurance, and £107,546 is carried forward. It is proposed to increase the capital from £4,000,000 to £6,000,000, and to convert the present 5 per cent. preference shares of £10 each into shares of £1 each, carrying 6 per cent. interest, holders of ordinary shares to receive a bonus from the reserve fund by the issue of five new 6 per cent. preference shares of £1 each for every ordinary share held, with 10s. per share paid up thereon, leaving 10s. per share to be paid in cash. Power is also to be asked to convert the present £10 ordinary shares into shares of £1 each.

BENZOL AND BY-PRODUCTS, LTD.—The accounts for the year ended March 31, 1922, show a trading loss of £44,494. After deducting the sum of £7,201 brought forward and £8,000 written back from income-tax and E.P.D. reserve, there remains a net loss of £29,293 to be carried forward. The directors consider that ample provision has been made for depreciation. The assets decreased in the period by £55,963, mainly through a reduction in stock-in-trade of £35,746. A settlement of the claim on the Coal Mines Department was effected, leaving £14,389 due to the company, which has since been received. The board state that they have business in hand which should bring considerable additional revenue. It is announced that the resolutions for reducing the capital from £700,000 to £573,690 by writing off the issued ordinary shares 10s. per share, and for dealing with the preference arrears, were passed at the meetings on June 19, and will be submitted for confirmation at a further meeting on July 4.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. NO.
Poland	Caustic soda, tallow, perfumery and ethereal oils	823
Spain	Chemicals	826
U.S.A.	Sulphate of ammonia, superphosphate and other fertilisers.....	833
Belgium	Pharmaceutical specialities, etc. ..	814
Spain	Chemical products and fertilisers..	824

Tariff Changes

NORWAY.—There has been a temporary all-round increase in import duties from 20 per cent. to 33⅓ per cent. as from June 11.

TUNIS.—The export of sulphate of ammonia has been prohibited, except to France and Algeria.

FRANCE.—Article 6 of the French Budget Law of February 28 provided that a certain quantity of ethyl alcohol must be purchased from the State by importers in order to obtain licences for the importation into France of petroleum and similar spirit, pure or mixed, destined to be consumed in France, and of benzols, toluenes, and spirits derived from coal tar, pure or mixed, with the exception of those used in the manufacture of colouring materials and chemical products. Alcohol so obtained must be used exclusively for generating motive power.

A Presidential Decree, dated May 30, and published in the French *Journal Officiel* for June 2, prescribes regulations for the execution of the above provisions. It provides that, as from November 2 next, an import licence must be obtained for each importation into France, under any Customs regime, of benzols, toluenes, and spirits derived from coal tar, pure or mixed. Consignments proved to have been dispatched direct to France before October 2 and products declared for warehousing on that date will, however, be admitted under the conditions at present in force. The Decree also lays down definitions of the products affected, fixes the sale price of the ethyl alcohol, etc.

The text (in French) of the regulations, and also of a Presidential Decree of May 31, respecting alcohol for generating motive power, may be consulted by persons interested on application to the Tariff Section, Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

New Physical Laboratories

THE Great Academies at Stonyhurst College were held on Wednesday, the occasion being marked by the formal opening of the new physical laboratories, which form the secular portion of the memorial to the memory of the 165 old students of the College who died in the war. Mr. H. C. John handed over, on behalf of the Stonyhurst Association and of the friends of the College, the new physics laboratories, which have been built at a cost of £11,000, to the Rector of the College, the Rev. E. O'Connor.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgment

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

AJAX MANUFACTURING CO., LTD., 62A, Loughborough Road, Brixton, paint manufacturer. (C.C., 30/6/23.) £13 13s. 10d. April 19.

Deed of Arrangement

PAYNE, Allen George Cooper, trading as ALLEN PAYNE AND CO., 1, Harrowby Street, Cardiff, and residing at Albert Road, Penarth, exporter and importer of oils and chemicals. (D.A., 30/6/23.) Filed June 21. Trustee, S. E. Clutterbuck, 31, Queen Street, Cardiff, I.A. Secured creditors, £1,359; liabilities unsecured, £5,387; assets, less secured claims, £809.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BOOSHU MANUFACTURING CO., LTD., London, E.C., polish manufacturers. (M., 30/6/23.) Registered June 5, £1,250 debenture, to E. V. F. R. Dugmore, 11, St. Mark's Road, Alverstoke, captain, R.N. (retired); general charge. *Nil. February 5, 1923.

RASTERMA, LTD., Barking, manufacturers of rat poisons (M., 30/6/23.) Registered April 26, £50 debenture, to D. G. Thomas, 19, Cambridge Road, Barking, timber foreman; general charge. *——. February 22, 1923.

London Gazette

Company Winding Up

LANCASHIRE PHOSPHATES, LTD. (C.W.U., 30/6/23.) James Todd, 7, Winckley Square, Preston, appointed liquidator (with a Committee of Inspection). May 18.

Notice of Dividend

FISHWICK, Albert Baden-Powell, residing at 98, Kirkmanshulme Lane, Longsight, Manchester, in the county of Lancaster, and carrying on business at 4, North Road, Longsight, under the style of BROWN AND CO., soap manufacturer. First and final dividend of 1s. 4d. per £, payable July 2, Official Receiver's Offices, Byrom Street, Manchester.

Company Winding Up Voluntarily

BRITONS, LTD. (C.W.U.V., 30/6/23.) A. E. Smethers 258, Grays Inn Road, London, W.C., appointed liquidator

New Companies Registered

CRAMPSHAW, LTD. Manufacturers of and dealers in all kinds of carbolic, creosotic and other disinfecting, deodorising fluids, powders, soaps, etc. Nominal capital, £500 in £1 shares. Secretary: E. Cadogan, Imperial Buildings, Mount Stuart Square, Cardiff.

KLENSO, LTD. Manufacturers of soaps, soap powders, etc. Nominal capital, £5,000 in £1 shares. Solicitor: C. J. Murray, 30, Parliament Street, Dublin.

A. S. SCOTT AND CO., LTD., 89, St. James Street, Manchester. To buy, manufacture, and fabricate into rods, wires, tubes and castings, metals required by the electrical, mechanical, and chemical industries. Nominal capital, £2,500 in £1 shares.

TREAMBLE MINERALS, LTD., Exchange Buildings, Station Road, Port Talbot. To carry on the business of getters and refiners of Fuller's earth and all other earths and clays, etc. Nominal capital, £20,000 in £1 shares.

WATERHOUSE AND GRAY, LTD., 51, Stanley Street, Sheffield, manufacturing chemists, wholesale druggists, drysalters, oil and colourmen, etc. Nominal capital, £1,000 in £1 shares.

WINDSOR RICHARDS PROTECTIVE PAINT CO., LTD., 104, High Holborn, London, W.C. Importers and manufacturers of and dealers in oils, paints, colours, varnishes, etc. Nominal capital, £1,000 in £1 shares.

Pulverised Fuel at the Detroit Edison Plant

WITH regard to the six new boilers of 325,000 lb. normal evaporation per hour each, which have been ordered by the Detroit Edison Co, to be fired with "Lopulco" pulverised fuel, it is stated that these boilers are of the "W" Stirling type of 29,000 sq. ft. heating surface, and will be installed at the new Trenton Channel Power Station. The equipment for the first section is to consist of six boilers and two 50,000 kW general electric turbines, and the working pressure is 425 lb. gauge with Babcock and Wilcox economisers. These boilers are intended to operate usually at about 300 per cent. American rating, that is, 300,150 lb. evaporation per hour, but are guaranteed to take 400 per cent. rating,—that is, 400,200 lb. per hour for peak loads and emergencies. The Detroit Edison Co. have made exhaustive investigation into the performance of the "Lopulco" installation at Lakeside, Milwaukee, as compared with their own plants on mechanical stokers, with corrections for the latest type of stoker that would be possible on a new plant. The nett results show an efficiency of 5–6 per cent. in favour of pulverised fuel, but an even more important point is stated to be that 400 per cent. rating can be operated without difficulty.

Potassium Chloride in Explosives

POTASSIUM chloride is used, particularly in England, in the composition of some blasting explosives, state Messrs. C. A. Taylor and W. H. Rinkenbach, assistant explosives chemist of the United States Department of the Interior, in Bulletin 219, recently issued by the Bureau of Mines. Like sodium chloride, it lowers the flame temperature, and, being less hydroscopic, it may be preferred to the former. The greater part of the world's supply of potassium chloride has come from the Stassfurt deposits. It has been put on the market in grades varying from 80 per cent., or slightly lower, to about 98 per cent., the remainder being largely sodium chloride. The impurities found in commercial "muriate" or potassium chloride are similar to those found in sodium chloride, but are generally present in larger proportions. Their determination is the same as that for sodium chloride.

Nauru and Ocean Island Phosphate

FURTHER reductions in the price of phosphate obtained from Nauru and Ocean Island will be made from July 1 next. The British Phosphate Commission has decided on a lowering of prices, notwithstanding that the cantilever structure for improving the loading facilities at Nauru has not yet been erected. When this work is completed it will be possible to further reduce the cost of the material. It is anticipated that the projected improvements will be completed within two years. The total annual output from Nauru and Ocean Island is now in the vicinity of 400,000 tons, but should this increase to 500,000 tons the supply will be equal to the demand at that rate for the next 200 years. Of the total output the Governments of Great Britain and Australia each take 42 per cent. and New Zealand 16 per cent.

The China Clay Trade Review

The Official Organ of the China Clay Industry and the only Journal specially devoted to its interests. Published in the third issue of "The Chemical Age" each month.

All Editorial communications should be addressed to the Editor, "The China Clay Trade Review," Benn Brothers, Ltd., 8, Bouverie Street, London, E.C.2. All communications relating to Advertisements, Subscriptions, and other business should be sent to the Manager, "The China Clay Trade Review," at the same address. Telegrams—"Allangas, Fleet, London." Telephone—City 9852 (6 lines).

Contents

A Prosperous 1923

THE past year has shown a decided improvement in china clay trading over that of 1921, whilst everything points to an even better year in 1923. The present rate of the Continental exchange is still a serious handicap to trading in pre-war quantities. Germany, who was one of our best customers in 1914, has so reduced the price of the mark as to be unable to purchase any quantity of clay from us, and she has been using her domestic clays as far as possible. At the same time china clay has been purchased by Germany during the last year, and, given anything like stabilisation of the mark in the near future, she should once again become a large buyer of our best English china clay. Russia, too, in 1914, took 37,137 tons of clay from Cornwall and Devon, but it is impossible to foretell when she will be in the market again for any quantity, though our export figures—published each month—show that even Russia is once again buying from us.

If labour troubles at home and abroad do not hamper us this year, there is every reason to take an optimistic view for 1923. The spirit of unrest—due to the great war—which seemed to dominate us all, both employer and employee, has to a great extent given way to the realisation of the fact that neither increase of wages nor profits can be commanded without serious application to duty on the part of everyone connected with our industry. Labour-saving methods are being employed and new ones being constantly tried out. It has been said that china clay producers wished for no change in production methods, and that it was a waste of time even to try to bring them before them. This can no longer be said, even if it were ever true. We believe that at no time in the history of the industry has there been such a keen desire on the part of both the employer and the employee to test fairly every labour-saving device for economical production that is put before them. Great economy in the consumption of coal has been effected in the "dries" of many of our large firms.

A keener interest in their work and a thirst for greater knowledge has been aroused in the minds of the employees, and we believe this will be all to the good of the employer. Cornwall and Devon have many able men working in the china clay pits who should be encouraged to put forward suggestions. It cannot be denied that the old order is changing, and that, with the tendency for firms to amalgamate into one huge concern, there is the danger of losing the cheery respect between master and man which has so long been a happy feature of our industry. In other trades it has been found that large concerns are apt to become "soulless." We trust that this may never be levelled against the china clay industry. Be the firm large or small, goodwill and hard work on the part of everyone are essential, and given these two things we believe that 1923 will be a prosperous year.

Has the "Associated" Served the Consumer?

PREVIOUS to the formation of the Associated China Clays, Ltd., it was open for anyone with small and often insufficient capital to come along and start a small china clay works, and sell to the agents of the middlemen inferior "top" clays, which were often substituted for established brands of medium quality. The grading of all clays and the fixing of the standard value of each brand according to its quality by the Associated China Clays, Ltd., has been very much to the benefit of the consumer. The "Associated" is composed of members of the smaller firms, as well as the larger, and is a guarantee that prices have been fairly regulated.

We have heard the "Associated" called a "trust," by consumers who wished to purchase at a cheaper price—often by firms who were themselves members of a similar association, and would be the first to uphold their own trade arrangements. Had profits been large, these few malcontents might have had some cause for complaint, but few firms engaged in the china clay industry can point to anything but loss in 1921. The Associated China Clays, Ltd., has held together the trade as a whole. Had the price-cutting competition continued some of the smaller firms must inevitably have gone out of business, whilst even the larger businesses must have found it difficult to pull through the depression of 1921. These smaller firms, in the future, may find it more difficult to compete than they have in the past, and should remember that, had it not been for the formation of the "Associated," competition by the larger firms would have been so severe that it is doubtful if they would have survived at all. The Associated China Clays, Ltd., has two more years to run, and there is a movement on foot to increase the life of the Association for another five years. Unlike some trade associations, which have kept up prices unjustifiably, the "Associated" have, on every occasion possible, reduced the prices to the consumer, and no charge of profiteering can ever be levelled against it. It is admitted by everyone who knows anything about the matter, that the Associated China Clays, Ltd., has been not only of great advantage to the trade, but also of material benefit to the consumer. If it continues to act on the principles of the past, long may it flourish!

Is there a Demand for Colloidal Clay?

SOME time ago a West of England newspaper published a series of articles on colloidal china clay. These articles caused much comment at the time, and correspondence followed, much of which was of a highly amusing character to those in the trade.

These articles, we admit, were excellent journalism, but meant little in actual fact. Whilst this correspondence was appearing, and long enough before, valuable work had been undertaken in the production of colloidal china clay, not by one firm alone, but by several who had been sending out samples of colloidal clay to manufacturers interested and obtaining their opinion on its merits. Here we would like to say that there are several different ways of producing "colloidal" clay, and the method of production is not confined to one particular firm or patents. Having said this, we would like to say also that we believe that there is a future for colloidal china clay in many different directions, and that all honour must be given to Mr. Feldenheimer and Mr. Plowman for their work in this direction.

These gentlemen, we believe, were the first to push the advantages and the manufacture of this clay in England. (Readers will remember the articles by Mr. Weston on Colloidal Clay in Soapmaking, which first appeared in THE CHEMICAL AGE.) We have seen samples of soap, ink, rubber, etc., in which collodial china clay manufactured under their direction has given excellent results. We believe 1923 will see great developments in the use of colloidal china clay.

China Clay Royalties

THE vexed question of royalties and minimum rents which china clay producers are called upon to pay by the lessors of the properties worked is one which might well receive the attention of our Members of Parliament recently elected and representing china clay interests. There would appear to be no sort of regularity as to these charges. Minimum rents vary from £50 to £2,000; royalties vary from 9d. upon mica clays up to as much as 7s. per ton on others. Whilst it is admitted that some landlords have been reasonable and even generous during bad trading years, others, or their agents, have insisted upon "their pound of flesh," which has borne very hardly on companies who have invested much money in developing their properties.

China clay is one of the most important raw materials that the Old Country can export, and it seems to us that this industry should not be wholly at the mercy of landlords, who may, or may not, use reasonable judgment in claiming these rents and royalties. It is said that at least one landlord has received as much as £30,000 per annum, whilst little or no money thus received goes back into the industry for further development of properties. Is it not time that the whole question of rents and royalties was dealt with by the State? In some quarters it is suggested that unification of the whole industry—royalty owners and producers—would do much to regain the world's markets. Certainly, if the royalty owners came into the industry, it would do much towards solving the difficult problem of fair payment for rents and royalties.

Advertising the Industry

WE suppose that every china clay firm at some time or other has found difficulty in finding suitable men to represent it on the selling side. Some of the larger firms employ representatives who can speak half a dozen languages, and these men are often highly paid, but we cannot help thinking that too often their efforts are not sufficiently backed up by the firm's advertising literature. Every firm has its own particular method of disposing of its product—some selling through middlemen, others direct to consumers, and again others appointing their agents in various countries and centres, through whom they sell to the consumer. All these selling arrangements have their adherents and advocates, answering their purpose well enough; but whichever system is adopted, unless it is backed up by consistent advertising, it cannot be expected to be productive of the best results.

A contemporary recently sent a special commissioner to Cornwall for a three months' visit, and the impression he brought back was that there was a great lack of interest displayed by the producers in enforcing upon the world the advantages of purchasing from the splendid deposits of china clay to be found in this country. He says: "For ourselves, we adhere to the view previously expressed that the capacity of output of the Devon and Cornish mines could be increased materially if effective steps were taken to enlighten oversea industrialists as to the value of this little known and versatile raw material. But so long as its control is centred in the hands of those who are apparently content to conceal its virtues from an inquisitive world, what is a most important British industry must necessarily remain comparatively fallow. Progress on modern lines, now so universally recognised, is what the china clay mines would most seem to stand in need of, and the co-operative propaganda which we have urged would be fully justified by the results, particularly in export markets."

We have heard producers lament the publicity given to china clay recently, bewailing the fact that money should have to be spent in advertising. At one time the industry was confined very much to certain families, and the demand for china clay, if it did not exceed the supply, was at least sufficient for very good profits. That day has, however, passed. Much "foreign" capital has now been introduced, and the "foreigner" is now in control of pits formerly in the hands of Cornishmen. The "foreigner" knows that advertising does not mean spending money, but that it is the sure and certain means of making money.

With new pits opening, both at home and abroad, new markets must be found for the supply. The old complacent attitude of "all is well, they *must* purchase from us," no longer holds good. The war has opened the eyes of many people. We believe it would surprise some of the English china clay producers if they knew how many callers we have at the offices of THE CHINA CLAY TRADE REVIEW who are opening and working new deposits of china clay in all parts of the world. The results may not be apparent at the moment, but before long some of them will be in the market against the Cornish producers, and it will not do for Cornishmen to take the attitude that the least said about china clay the better.

America, too, as our correspondent, signing himself "One Who Knows," pointed out in last month's REVIEW, is already purchasing domestic clays in a way she has never done before, and this, we believe, is due to the improved methods of production now being adopted there. It is all very well to say that other countries are bound to come to us for "best" clays. That may be so, but what proportion of the Cornish pits are producing "best" clays? There is a far larger proportion of medium and common clays to be disposed of, and this is where we are being overtaken. Greater enterprise must be displayed in 1923 by some producers if markets are to be retained.

China Clay Exports

THE figures we were able to give in our last issue, showing the various countries to which china clay has been exported, together with the tonnage and value, have been much appreciated by the trade. We have pleasure in announcing that we shall, in the future, publish a monthly list of these returns.

In 1912 Germany was taking 105,978 tons of china clay from us, and even up to August of 1914 she had taken 47,246 tons. We wonder when she will appear in our list again as a buyer at anything like pre-war quantities.

China Clay in 1922: A Retrospect

A Record Post-War Year

AFTER a slump year (1921) of unprecedented depression, the china clay industry of England (Cornwall and Devon), closed the year in high spirits, for 1922 stands out as its best post-war year with a total tonnage of approximately 740,000 tons. When we record the fact that this figure is nearly 400,000 tons above that of the previous year, the extent of the revival of the china clay industry in 1922 will be fully appreciated. A gratifying feature of the revival was the demand in the export markets, representing two-thirds of the total trade, a ratio which obtained in relation to the total volume of pre-war trade. Compared with the pre-war annual average, 1922 was down about 200,000 tons, of which the drop in the export trade would account for over 100,000 tons.

The American Market

The most interesting feature of the export trade during the past year has been the reopening of the American markets on a large scale—in fact, approximating to the pre-war scale. The growth of the American demand for china clay in the last 20 years has been one of the chief factors in the development of the china clay industry in the West of England; in normal years the demand seldom now drops below 250,000 tons, twice in the last ten years exceeding 315,000 tons. In 1912, America took 252,382 tons; in 1913—247,705 tons; in 1914—320,217 tons (a record); in 1916—235,187 tons; in 1920—317,979 tons. This past year her total has again considerably exceeded the 250,000 mark, for in the ten months ended October the figures available for this period show she had then shipped 228,824 tons.

Competition of American Clays

Ever since our English china clays reached the vogue they did several years ago in America, they have been threatened with the competition of American clays. The restoration of our exports over there to practically the pre-war figure shows that our clays still command the position on account of their superiority coupled with advantages of cheap transport which enable them to compete as regards price. The development of the American domestic clays is undoubtedly affecting the demand for our common grades of clay, which are used in the main in the commoner classes of ware and in certain classes of paper. The bulk of the china clay exported to America is used in paper manufacture, especially in coated papers, the growth of the demand for this purpose having been coincident with the invention and improvement of paper-coating machines adapted, from their inception, for using English china clays. The tremendous increase in the use of these machines to meet the stupendous demand for paper for publications, especially of the illustrated type—for the production of which china clay coated papers are particularly suitable—encourage the hope that the American market for English china clays will not only be maintained but increased.

European Markets

Though not to the same extent, 1922 also marked a revival in the European markets, those of Belgium, France and the Netherlands being the most conspicuous. For the first time since the war Germany, who before the war was our second best export customer, taking 90,000 tons per annum, resumed direct trade, taking 6,102 tons over the year. Last year she increased her orders, taking delivery in the ten months ended October of 9,445 tons to the value of £28,447. Russia is the other black spot upon the industry's export trade, she taking before the war 50,000 tons per annum. She has resumed trade on a very small scale, in the ten months last year taking 3,060 tons, to the value of £6,949. Of the other importing countries, Belgium, the Netherlands, France, Scandinavia, Spain and Italy have all participated in the revived demand for china clay during 1922, though it does not yet approximate to the pre-war volume. With the reduction of prices by 3s. per ton for the common grades of china clay, which came into force at the beginning of this year, an impetus is already being given to the trade on the Continent, where the demand for our common clays is considerable and where we are becoming increasingly favourably placed in competing with inferior foreign clays which have been given an artificial advantage through after-war trade conditions. In both the American and the near European markets, the china clay industry has opened the year well and promises to eclipse 1922. The home market, too, is reviving in sympathy, and it is anticipated that it will improve as the year advances.

China Clay Dries

Some Peculiarities and Improvements

As there have been changes and improvements in the production processes in china clay mines and works in recent years, so there have been in the plant for finishing off process of drying. Perhaps in no direction have china clay producers seen more possibilities of making economies than in drying, on which the coal price factor has such an important bearing.

So far very little headway has been made with any process that will economically and efficiently supersede the old style of coal dry. Experiments have been and are being made with gas and electricity, but as yet they have not reached the practical commercial stage.

New Drying Devices

While this is the case, the china clay producers have not been apathetic, for many of them have introduced improvements and devices which have had the effect of greatly increasing the percentage of clay dried per ton of coal. A fair average in the ordinary way is to dry ten tons of clay per ton of coal, but by new processes of their own, introduced notably by English China Clays, Ltd., and Messrs. John Lovering & Co., some producers are now doing a very much larger ratio than this. The saving is mainly secured by the introduction of devices at the furnace end, whereby all the heat is conserved for the drying process and cold air prevented from getting into direct contact with the fires.

Covered Flue Principle

All dries are built on one principle—viz., covered flues, the surface of which forms the drying pan, conveying the heat the whole length of the dry from the furnace to the chimney stack. The situation, length and height of stack are all factors that have influences upon the draught and upon the drying capacity. Until quite recently producers always built a circular stack, but square stacks are now favoured by builders of new dries. Notable examples are those attached to Messrs. J. Lovering & Co.'s twin dry in Bodmin Road (St. Austell) Valley, the one built on an eminence some distance away from the new dry Cornish Kaolin, Ltd., have just opened at Bodmin Road railway junction, and the one Messrs. Parkyn & Peters are having in connection with their new dry at Par Moor.

Two novel features of Messrs. Parkyn & Peters' dry are the erection of decorated loading archways in the linhay and the name of the firm worked in mosaic style with blue bricks in the stack and visible from the G.W. Railway.

Twin Dries

Two modern examples of the twin type of dry are those of Great Treverbyn and Ruddle Common Companies at Par Moor and Messrs. John Lovering & Co. in Bodmin Road Valley. The former is a pre-war production, the latter a post-war one. Messrs. Lovering undertook the erection of theirs at a time when unemployment was very acute and when materials were very expensive. Though it was a very costly affair, the relief it gave to a large number of unemployed ex-service clay workers was very welcome. This by the way.

Great Treverbyn's "twin" has one stack in the centre and furnaces at each end, with, of course, two coal houses. In the "twin," Messrs. Lovering have reversed this order by having their chimney stacks at the ends of their furnaces and coal house in the centre. It is built alongside the new G.W.R. mineral railway.

Alumina from Clay

THE discovery of a method of producing alumina, the original material for manufacturing aluminium, from clay has been made by Mr. Hiroshi Tanaka, Japan, attached to the Department of Agriculture and Commerce. During the war, when the supply of alumina from America practically ceased, scientists in Germany endeavoured to discover a method of production, but were unsuccessful.

Among the Cornish China Clay Mines

A Visit to the Works of H. D. Pochin & Co.

(From Our Own Correspondent.)

The map of Cornwall showing the numerous china clay mines of the firm of Messrs. H. D. Pochin and Co., which has appeared in the advertising columns of this journal from time to time, has certainly revealed ingenuity and originality to a marked degree.

For the benefit of their ever expanding clientèle and of our readers generally, I made a special visit to some of Messrs. H. D. Pochin and Co.'s china clay mining installations recently, and it was quite a revelation of what sound business experience and control, combined with the manifold resources of a well-established firm, can achieve. It will be impossible to trace with any degree of exactness the progress and development of this firm even as far as it concerns the china clay industry. Their huge establishment with business tentacles in so many directions, and in all parts of the world, is practically the evolution of three ideals inherently pursued by the firm for more than a century. The first relates to the quality of the goods; the second, promptitude in despatch, and the third, efficiency of their business system.

Manufacture of Aluminium Cake

More than half a century ago the late Mr. H. D. Pochin discovered a process for the manufacture of aluminium cake, using china clay as its chief ingredient. This new form of alumina, which became so largely used by papermakers throughout the world, proved a notable triumph for the firm, who were then more concerned in the manufacture of chemicals. The firm was, even at that period, a fairly large consumer of china clay, but the demand for their aluminous cake exceeded the most hopeful expectations, and this necessitated the acquisition of their own china clay mines. As a result, the famous Gothers mine (Fig. 1) in the parish of St. Dennis was acquired in the early seventies. Gothers mine at that period was but a small proposition for the firm of H. D. Pochin and Co., and under the early direction of Mr. William Pochin the capacity of this mine was revolutionised. It was at Gothers that the gas engine for pumping and also winding was first introduced which is now rapidly usurping the method of power created by the old Cornish steam pumping engines.

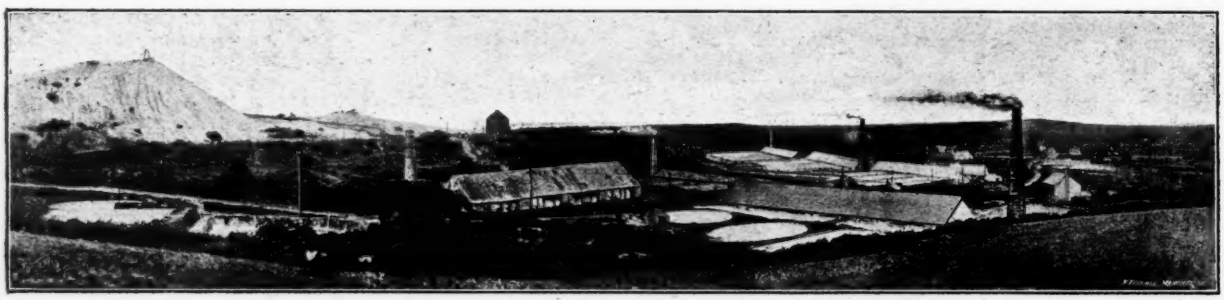


Fig. 1—The Gothers Mine

There are six very large drying kilns, and the mica drags and tanks are ingeniously constructed with the view to the elimination of all impurities as well as effecting the utmost economy. Over 40 years ago a light railway was constructed linking up each of the kilns with the main line of railway, passing through a couple of miles of the famous Goss Moors, owned by Lord Falmouth. The storage capacity of clay ready for shipment at Gothers is nearly 6,000 tons, which enables the firm to accelerate large shipments when required.

Messrs. Pochin know to a decimal fraction the entire cost of production and distribution, and know also that great elemental truth of commerce—that the highest possible value is the only road to progressive demand and steady prosperity. The older generation brought to the firm a wisdom and prudence in finance as well as great qualities and gifts of administration, and it is interesting to observe that the principles upon which the business was founded remain the principles which guide it still.

Important expansions followed the acquisition of the Balleswidden and the Leswidden Mines in West Cornwall, and the extension of the loading facilities at the Penzance docks. At Parsons Park the appliances for production were brought up to date by a powerful water turbine and a gas engine. The mine is connected with the drying kiln nine miles away by an earthenware pipe line and is linked with the main Great Western Railway line at Liskeard, and also the Looe Railway, where the firm have secured private facilities for loading.

It was, however, subsequent changes which marked a momentous era in the history of the firm whereby their productive capacity in china clay alone approximated 200,000 tons per annum. The possession of Gunheath (a mine with a world-wide reputation), South Caudledown, South Goonvean and the Wheal Remfry china clay mines, together with several well-known china stone quarries and grinding mills, and also a valuable ball clay deposit at Mainbow and New Bridge in Devonshire, have made the firm one of the largest producers in the industry. Enterprise and energy seem to stand out as the characteristics of the firm from its inception. The cordial relations which exist between the firm and their employees are also largely contributive to the unobstructed progress reflected throughout their long commercial life. Messrs. H. D. Pochin recognise that the men are quite as anxious as their employers to work and do their bit in the reclamation of the industry. Although I have frequently been in the vicinity of the Gunheath Mine (Fig. 2), this occasion was practically my first visit to the works. This mine, which has had a great reputation for more than a century, has been in the possession of the Higman family, who have been associated with the china clay industry for the past century.

I was received in the works by Captain W. Kellow. Mr. J. W. Higman, jun., who is a son of Mr. J. W. Higman, J.P., the former proprietor of the Gunheath Mine, and who, I was glad to observe, was fulfilling the highest traditions of an illustrious family, was accompanying him. This mine has evidently been one of the bright spots throughout the period of trade depression. Its native blue clay, so naturally adaptable for quite a variety of uses, has maintained such a steady demand that no slack time has been experienced by the clay workers. During the erection of the new dry micas, and the pipe line connecting the micas with No. 2 and No. 4 Kilns, the firm found employment for over 50 men, but now on completion they have returned to their former normal engagement of 110 men. Mr. Higman informed me that the excellent brands produced at Gunheath were the G.H., G.H.R. native blue clays and the H.D.R., a superior potting clay which has met with such great demand from the papermaking, bleaching and potting markets, both at home and abroad, that their productive capacity of 125 tons per day from these pits has been insufficient to meet their requirements.

A Well-known Mine

Looking down into the pits from the old engine house one is amazed that a larger cavity has not been made after nearly a century of working. There can be little, if any, anxiety entertained by Messrs. H. D. Pochin and Co., regarding the future of their enterprise, as the clay is known to exist far beyond the present actual workings, and even if the demand be doubled or trebled the deposit would not be exhausted. The equipment of this mine is the latest and best. In the pit there is installed a 120 h.p. gas engine generating electricity for an electrical motor-driven centrifugal pump, and this, with the Cornish engine, has a total pumping capacity of 1,800 gallons per minute. The winding of the whole of the sand is accomplished by a 65 h.p. Campbell gas engine. The clay is washed on the hydraulic system and gives the highest satisfaction. As soon as the clay water reaches the surface it begins its refining process, first through a series of micas, which is practically from 15 to 20 channels about 1½ ft. wide, and 220 ft. long, all constructed in concrete. At the bottom this clay has to pass through a very fine succession of gauze traps which eliminates all impurities and foreign matter.

The old settling pits and tanks have been improved, and several new ones constructed to provide the additional output required. These extensions and that of the new kiln have been carried out from the designs of the firm's own architect. The kilns are advantageously connected with the railway line at Gunheath, which forms the terminus of the Bugle and Stenalees branch of the Great Western Railway. The electrification of the Gunheath Mine was certainly a great achievement.

The steam for the Cornish pumping engine is derived from two Cornish and one Lancashire boilers.

At the firm's invitation I also saw the South Caudledown Mine (Fig. 3) situated about a mile distant. This mine, although more famous than Gunheath on the point of quality, presents quite a difficult problem to the proprietors, which, however, they are undertaking with their characteristic energy. This pit is hard to describe. It resembles a white ravine, penetrating to a great depth, and is long and narrow. It is bound on one side by granite craters of enormous dimensions, rendering the extraction of clay so extensively concealed underneath a rather unenviable task. Mr. Higman informed me that the development of this mine was obviously an expensive proposition, but the firm were determined to utilise their best endeavour to make it an eventual success. The narrowness of the pit precludes the usual winding operations for the present, but arrangements are being pushed forward for its ultimate adoption.

This mine was the first to adopt the Blondin method of removing overburden. The notable brands produced at South Caudledown are in greater demand than can be obtained, both among the paper and higher grade pottery manufacturers. However, the destinies of the large range of china clay mines are in the capable hands of the chairman, the Hon. H. D. McLaren, M.P., C.B.E., and the managing director, Mr. H. Stanley Pochin, J.P., whose guiding influence is followed with great interest by the whole community.

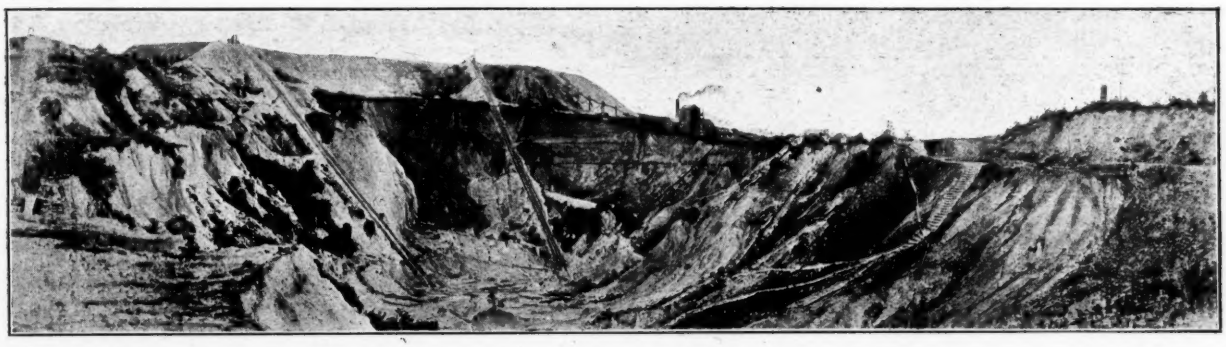


Fig. 2—The Gunheath Mine

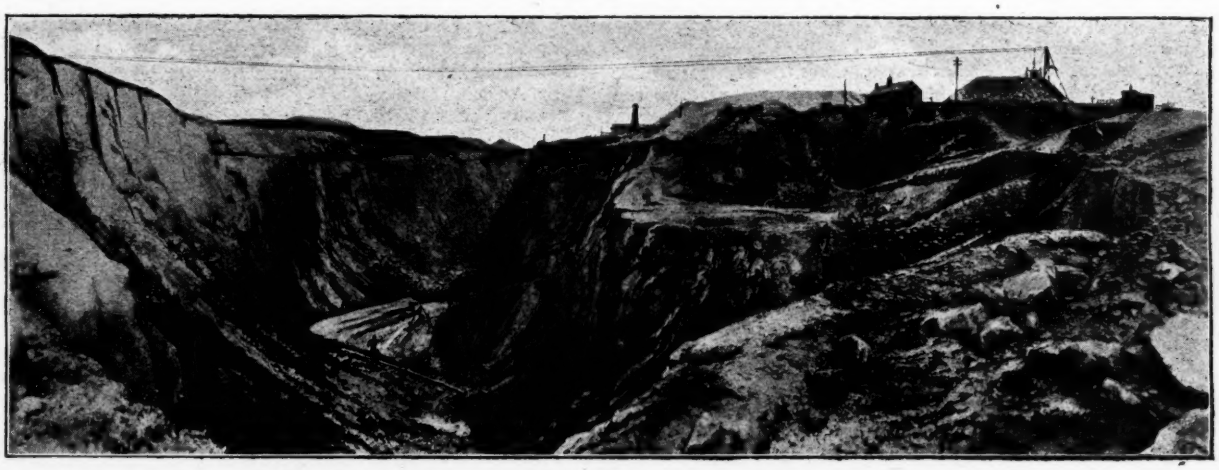


Fig. 3—The South Caudledown Workings

The Month at St. Austell

(From Our Own Correspondent.)

Although the closing of each year has invariably been a season of quietness as far as the china clay industry is concerned, the month of December, 1922, has proved an exception and will be reflected upon as a rather eventful and interesting period. It marked the conclusion of a very successful year for the china clay trade by a gradual approach to its normal capacity, which should be particularly gratifying to those intimately associated in the resuscitation of a threatened industry, as well as the community generally.

The shipping at Fowey during the month of December reminded those engaged on the jetties of the pre-war days and scenes of activity were well maintained throughout the month. The principal loadings were the *James B. Duke*, an American boat, which took 7,000 tons to Philadelphia; *Allerton* (British), 1,050 tons to Rouen; *Emilemaersk* (Norwegian), 3,300 tons to Portland, Maine; *Kilbergen* (Dutch), 7,000 tons to Philadelphia; *Spaainstroom* (Dutch), 1,250 tons to Amsterdam; *Teubergen* (Dutch), 6,000 tons to Boston; *Rigmor* (Danish), 1,400 tons to Genoa; *Marwestroom*, 1,400 tons to Amsterdam; *River Trent* (British), 5,000 tons to Portland; *Rapidto* (British), 2,500 tons to Genoa. There were also forty-five smaller steamers and motor vessels, and six sailing craft which were despatched with lesser consignments to the various home and Continental markets.

Notwithstanding the progress achieved in the past year, the industry has undoubtedly been beset with some difficult problems, but these it is now hoped have been to a large extent solved.

Introduction of Labour Saving Devices

The year 1922 will go down into history as a year of unparalleled development by the more aggressive producing firms because of the adoption of so many economic devices for the reduction of productive charges. Since the abnormal increase in the cost of coals the majority of producers have revolutionised their power plants with satisfactory results, and have effected a very great saving from the old method, though at a large initial outlay. As an example, English China Clays, Ltd., acquired three 4-cylinder Premier gas engines with a capacity of over 250 horse-power each. Two of these powerful engines have just been started at Leemoov, where the firm have three of the best mines extant. These gas engines have displaced no fewer than eight steam engines. It has been proved over and over again that the consumption of coal under the old method worked out at something like 6 to 8 lb. of coal per horse-power per hour, whilst the new method of generating electricity by suction gas plants would only consume 1 lb. of coal per horse-power per hour. It required over 60 tons of coal per week of one shift of eight hours per day for the steam engines, and now under the new system there is a saving of quite 50 tons weekly. In addition to this fact the distribution of power is controlled by one man instead of eight. At Stannon, St. Breward English China Clays, Ltd., have long discarded their steam plant and have disposed of their magnificent triple expansion engine of 175 horse-power, which required two large Lancashire boilers to create the necessary steam. The new plant comprises a couple of gas engines of 175 horse-power each, but only one is necessary at one time. The double-stroke pump, which is driven by the gas engine, is of enormous capacity and its reliability is being fully attested in the raising of over 50,000 gallons of liquid clay per hour. The double-winding drums are also operated from the engine house and the clockwork indicators mark the progress of the wagons laden with sand and stones as they are hauled from the pit's bottom to the surface, where the contents are discharged on those sand hills which form such a characteristic feature of the industry.

Drying methods have been improved and better constructed furnaces have replaced the older ones. These new methods dry the clay better and more expeditiously with a minimum consumption of coal.

The Wheal Remfry Mine

The enterprising firm of Messrs. H. D. Pochin and Co., of Manchester, have decided to develop their Wheal Remfry mine, which is situated in the Ful Valley; the Truro City Corporation brought an action recently to restrict the proprietors of the mine from allowing the mica to flow into the Ful River, because it was alleged that silting of the river at Truro was creating an obstruction to navigation. The case aroused considerable interest in the industry and the final judgment on the dispute is awaited with much interest. The Wheal Remfry mine is capable of producing at present with its four dries about 25,000 tons per annum, and according to the information which I have received from Mr. J. H. Higman, jun., the general manager of the firm at St. Austell, this output will be increased to well over 50,000 tons, and as soon as the firm's own constructional engineer can prepare the plans three modern kilns—or dries—are to be erected in the new year. This will mean a relative increase in each phase of production and will provide a source of employment in many directions for a considerable number throughout the year. The provision of three large modern kilns, with the necessary tanks, settling pits, and refining micas, is no small undertaking, and the district is fortunate in having such developments when so much unemployment is not a mere apparition.

The two new kilns which have been erected on the Bodmin Road near the town of St. Austell have just been completed by Messrs. John Lovering and Co., the old-established firm of china clay producers of St. Austell. These kilns are situated alongside the new railway branching off from the western end of the St. Austell Station to Carthew, and are of peculiar interest to the trade as the firm have adopted quite a new feature with regard to the furnaces by the application of gaseous fuel, which I understand is giving entire satisfaction in an accelerated and economic process. In a conversation with Mr. John Lovering, jun., I was informed that the new kilns were principally erected to absorb several of their old workmen who were affected through trade depression. The kilns are connected with the pits at Carbean by a pipe line and are equipped with the best improved methods of refining and every facility for storing and loading the clay into the railway wagons. Between thirteen and fourteen thousand tons will be dried in the new kilns annually and being in such close proximity to St. Austell Station the transmission of china clay and coals will make an appreciable difference to the expenditure of the proprietors.

I was pleased to hear Captain Denis Shipwright, M.P. for Penryn and Falmouth Division, which embraces the whole of the china clay area of St. Austell district, speak of his personal interest in the china clay trade, whilst on a visit to St. Austell, about midsummer last. Since then it has been announced that the china clay works on the Porthia Estate, St. Ives, West Cornwall, have been in course of construction for twelve months, and are now nearing completion; and it is anticipated that washing operations and selling of clay will shortly be commenced. Captain Denis Shipwright, M.P.,

Capt. Denis Shipwright, M.P.

will be the chief director of the company to be formed, which will be known as The Porthia China Clays, Ltd. It is Captain Denis Shipwright's intention to open up a second pit at Breja, about three-quarters of a mile distant, which will be connected with the present workings by a pipe line which will necessitate the extension of the already constructed settling pits and tanks. The works have given employment to several men for nearly two years, and are expected to develop into a flourishing adjunct to the Cornish industry. Capt. Shipwright has, it is understood, secured the services of some skilled clay workers from his own division.

Capt. A. H. Moreing, M.P.

Capt. A. H. Moreing, the newly-elected M.P. for the Camborne Division of Cornwall, is also actively associated with the china clay industry. He is one of the managing directors of the Cornish Kaolin, Ltd., a company which have been considerably developing their works at Bodmin Road Station, near Bodmin, where a new kiln has just been finished. Capt. Moreing, M.P., is also a director of Varcoes China Clays, Ltd., whose head offices are at St. Austell.

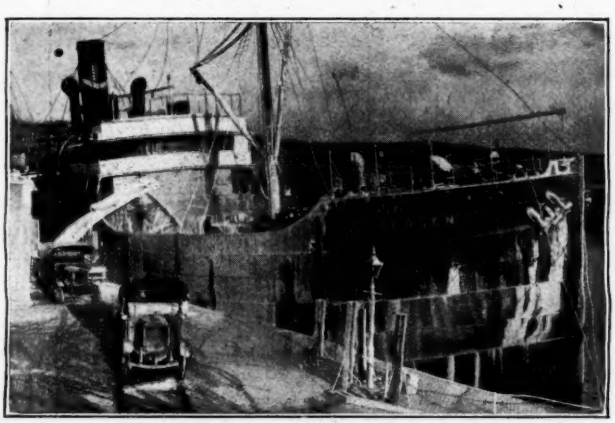
It must be a source of interest to the trade to observe the importance attached to the china clay industry by the Local Governing bodies.

St. Austell Station Accommodation

At the last meeting of the St. Austell Rural District Council, W. Tresidder, J.P., of Charlestown, called attention to the unsatisfactory accommodation afforded by the Great Western Railway Company at the St. Austell Station. It was not only inadequate for the demands of the large district it served, but the clay dust from the loading wharfs so close to the up-platform often made it unpleasant for the general public. The china clay trade is one of the best assets which the Great Western Railway have got, and no doubt something will be done in response to the District Council's request.

The Port of Penzance

The Town Council of Penzance have adopted the scheme prepared by the Borough Engineer for increasing the shipping facilities in the harbour at an estimated cost of £13,000. The proposed scheme comprises the widening of the North arm, with a retaining wall, for a total length of 300 ft., and deepening of the harbour at that point. Here the principal firm engaged in the china clay industry is the firm of Messrs. H. D. Pochin and Co., who have considerably developed their Leswidden and Balleswidden mines at St. Just, as well as the McLaren China Clay Works. Messrs. H. D. Pochin, in a letter to the Council, urged the necessity of providing on the quay-side, extra storage capacity for their china clay trade, and mentioned that they had been unable to accept the offer of ships owing to the present limited accommodation. They would undoubtedly export a larger quantity of clay if the requisite stores were available. The directors of the firm



Steamship loading China Clay at Penzance

were convinced that additional storage would soon pay for itself. Capt. Lugg pointed out the great difficulty under which the Coast Lines, Ltd., were obliged to conduct their business at the port, and said that the Council would certainly have to effect some improvement, and proposed the adoption of the scheme. Mr. W. J. Bazley, in seconding, remarked that as a Council they could venture on so desirable an improvement without hesitation. The quay could not receive any more sea-traffic in its present state, which meant the loss of boats and revenue. He felt satisfied that that development would give a reasonable interest on expenditure and enhance the value of the borough's property in the harbour. A councillor asked whether trade could be guaranteed if the accommodation were provided. Mr. George Poole replied that Messrs. H. D. Pochin were so satisfied with the clay deposits at St. Just that they had spent a large amount of money on their development. The success or failure of the clay trade in Penzance rested with the Council. The company were likely to export 40,000 tons a year providing they had facilities and there would be a considerable importation of coals which were necessary for the works. Mr. Howell Mabbot, ex-mayor, declared that increased accommodation had to be found for a growing harbour trade. In china clay they would lose a promising industry, and if they lost the Coast Lines connection with the tradespeople they would be at the mercy of the railway.

Visit of Mr. C. H. Knight

Mr. C. H. Knight, President of the Papermakers' Importing Co., of America, has been another distinguished visitor to the clay town of St. Austell on a visit to the English offices of the firm. Mr. Knight said that the English clay trade with America had been very good all through 1922; in fact, trade had made a wonderful recovery and the prospects for the new year were in his opinion decidedly favourable. The strike among the potters was a disturbing element for the time, but the Government's intervention had a salutary effect on the movement, which did not receive the endorsement of the men's leaders. The trouble arose over the adoption of a new principle of manufacture by the installation of the costing method.

Mrs. G. H. Grenfell

The many friends of Mr. G. H. Grenfell, official cashier of the firm of the English China Clays, Ltd., at St. Austell, will be pleased to learn that Mrs. Grenfell is rapidly recovering from a serious operation during the Christmas, at a London nursing home. Mrs. Grenfell is a daughter of the late Mr. Thomas Stocker, who was the managing director of the West of England China Clay Co., Ltd., for so many years, and, of course, a sister to Mr. T. Medland Stocker, J.P., one of the present managers of the English China Clays, Ltd., and also the Associated China Clays, Ltd.

Christmas Benevolence

It is interesting to observe how solicitous those engaged in the china clay industry are towards deserving objects. Mr. W. Rose, J.P., principal of the firm of Messrs. North and Rose, St. Austell, discharged the "rôle" of Father Christmas at an entertainment for the children in the City of Truro, and the family of the late Mr. Edward Stocker sent their usual substantial gift to the inmates of the St. Austell Workhouse, which the Board of Guardians accepted with a grateful vote of thanks.

Mr. T. J. Malone

We regret to learn that Mr. T. J. Malone, of Bojea, near St. Austell, who recently gave an interesting paper on china clay particles to the weekly meeting of the St. Austell Rotarian Society, has been laid aside, and only just now enabled to resume his official duties with the firm of Messrs. North and Rose at St. Austell. For many years Mr. Malone has been adroitly and scientifically penetrating into the mysteries of china clay that his exposition proved quite a revelation. Mr. Malone has for a long period been engaged in the laboratory department of the firm of Messrs. North and Rose, and the results of his investigations and research are applied to the firm's productive works at Rocks, near Bugle. The superior brands of clay produced by the firm are in great demand by chemical manufacturers and other finer uses.

Improving Trade

On January, 6, says a correspondent, I had an opportunity of visiting several important china clay localities and was much impressed with the resuscitation of trade everywhere. About midsummer last, on a similar visit, there were many of the kilns closed down, but on this occasion all those high chimney stacks were smoking and drying operations were proceeding at full pressure. Passing alongside a group of six kilns I inquired of one of the men whether trade was brisk, and I was informed that they had more orders than they could fulfil even with the six dries working at their utmost pressure.

Notes and News

No Sunday Golf at St. Austell

THE ST. AUSTELL Golf Club have turned down by a large majority the proposal that golf should be permissible on the links on Sunday. Golf enthusiasts in the china clay trade (and there seem to be many) will have to go further afield if they desire a game on the Sabbath!

More Visitors to U.S.A.

We understand that Mr. Feldenheimer, of Catapol, Ltd., has been on a visit to the U.S.A. in December and has now returned from his trip.

The Medical Profession and Colloidal Clay

We learn that there is quite a demand amongst the medical profession for colloidal china clay, which forms the base of medicines from which most wonderful cures have been effected. We hope to furnish further details in a later issue.

Funeral of Mrs. R. J. Varcoe

We desire to express our sympathy with Mr. R. J. Varcoe on the death of his wife last month. It has called forth widespread sympathy with the family. The interment took place at St. Dennis, the Rector (the Rev. J. C. Barfleet) officiating. Many of the employees of the Goonvean and also the St. Dennis and Parkindillack China Clay Works, with which Mr. R. J. Varcoe is associated as its managing director, were present. Unfortunately Mr. Varcoe was unable to attend the obsequies through indisposition. The family mourners were: Mr. R. J. Varcoe (son), Miss Edith Varcoe (daughter), Miss E. M. Varcoe, Falmouth (sister-in-law); Mr. Mark Gatley, Mrs. J. Truscott Mr. J. Gatley, St. Columb; Mrs. C. Williams, Fowey (brothers and sisters); Mrs. H. Gatley, St. Columb (uncle); Mr. Arthur Truscott (nephew), Mr. C. Williams (brother-in-law), Mr. R. Cock and Miss J. Cock, Wadebridge; Mr. and Mrs. J. Brown, St. Kew; Mr. and Mrs. C. Knight, Lanivet (cousins).

The bearers were Captains W. H. Bunt and C. Bullock, and Mr. J. Job, of the Goonvean China Clay Works; Captains J. H. Hill and T. Hill, of the St. Dennis and Parkindillack China Clay Works; and Mr. J. D. Thomas, St. Dennis. The Goonvean China Clay Company was represented by Messrs. A. J. Best, Robert Varcoe, Richard Varcoe (Resugga), Isaac Grigg and W. A. Tom, directors; and the St. Dennis and Parkindillack China Clay Company by Messrs. A. J. Best and W. Boon, directors; Mr. H. N. George, secretary; and Mr. H. Searle, clerk.

Interest in China Clay

A contemporary has the following paragraph relating to the interest now aroused by the many uses of china clay: "The prevailing but mistaken impression being that china clay is solely employed in the manufacture of pottery. The many other industries in which it forms a basic part, alluded to by our Commissioner in his exhaustive review of the subject, would therefore appear to have come as a revelation to industrialists in countries where the numerous uses to which china clay can be put are not so generally understood as in Great Britain, and would seem to emphasise the conclusion come to by our Commissioner that if the Cornish producers are desirous of extending their export markets they should, either collectively through their Association or individually, as may be deemed expedient, take early steps, to quote our Commissioner, 'to see that there is not a centre of commercial activity where the versatile qualities of china clay as a raw material are not known.'" We would point out that *The China Clay Trade Review* has for over three years past fulfilled this mission, and will continue to do so in the future, to an even greater extent than in the past.

Colloidal Chemistry

Now that some progress is being made in developing the production of colloidal clay from china clay, it is interesting to note that Dr. Hermann Plauson at the Plauson Institute, on the Jarrestrasse, in Hamburg, is attracting the notice of chemists to his wonderfully equipped laboratories for the production of colloids. There is shown a full range of exhibits of materials that can be produced by the aid of the colloid mill. A recent visitor to the Institute says: "I have seen colloids produced by Plauson, and also by others, tested in such a manner that one is able to state that such and such a colloid contains particles of this or that size, and in such and such proportion. The methods of analysis are as accurate as those employed in other branches of chemistry."

Mr. S. P. Bunn

We are glad to learn that the operation that Mr. S. P. Bunn has had to undergo in a London nursing home has been successful, and that he is now able to resume his work in St. Austell. As our readers know, Mr. Bunn has been connected with *The China Clay Trade Review* since its commencement in 1919. Always having the well-being of the china clay industry at heart, he has done much by his articles to create interest in the manifold uses to which china clay can be put, and we hope to have more from his pen in the near future. Mr. Bunn spent Christmas at the house of Sir Edward Nichols at Shepperton, as at that time he was hardly well enough for the journey back to St. Austell. We are sure that all our readers will join us in wishing him complete recovery to health.

China Clay in Paving Blocks

As our readers know, we have on more than one occasion drawn attention to the fact that road paving blocks in which china clay is used, were being made experimentally. We understand that they are now being tested out on a long stretch of road, and that a company will shortly be formed to make these blocks in very large quantities. We are, at the moment, unaware to what extent china clay is to be used in the manufacture of these blocks, but understand that should the invention prove as successful as is anticipated, there should be some good orders for china clay producers. The paving block made of rubber composition, which is said to compete in price with the ordinary wood block, has been produced by a London firm, who claim that, in use, their product will last for fifteen years though subjected to the heaviest traffic. That the composition block would result in a reduction of traffic noise is one of the merits which its manufacturers urge. Two types of blocks have been produced—a number one block, made of the "core" surfaced with a half-inch hard vulcanised rubber, and a number two block, which consists of the "core" only. The principal ingredients of the "core," which has been patented, are rubber, jute, and china clay. As a result of various experiments, the inventor has decided that the separate solid block gives the best results. The block "core," it is claimed, can be made at 2d. per lb; a much lower price than that of wooden blocks.

Grit and China Clay

At a recent lecture at the St. Austell Rotary Club, Mr. J. M. Coon explained, by the aid of a microscope, how different tests could be made to discover and classify the various substances to be found in china clay. As an instance of the practical value of the tests to which china clay could be put, Mr. Coon said that at the present time the prices of china clay were high compared with pre-war, and as a result the users of china clay, especially in the paper and chemical trades, were very particular that the china clay should not contain anything of a gritty nature. Consequently, they were trying to get the china clay merchants to give guarantees as to the fineness of the article. Sometimes manufacturers sent back complaints that a cargo had so much grit in it. The question was whether that so-called grit was grit or china clay, and it was here that the microscope was of great value. Only recently samples of china clay that were supposed to contain grit were subjected to those tests and were found to contain no grit at all. By the aid of those miscroscopic tests they were able to speak with authority to users of china clay.

China Clay Outlook

In discussing the outlook for 1923 of the various Cornish industries the *Western Morning News* says: "In the china clay industry, also, the outlook is certainly brighter, and the increased business done during the year has been gratifying. The conditions have been better than in the previous year—one of the blackest in the history of the trade—but, although a great many men have been gradually absorbed, unemployment is still very considerable, and hundreds are securing only a bare existence on the dole and parochial relief. The output of china clay has advanced substantially during the 12 months. The despatches from the area have steadily risen month by month. In July the quantity sent from the district was 72,223 tons, and in October, the best recorded period, 76,700 tons. The exports for ten recorded months were

higher than for any similar period since pre-war days, exceeding by 15,000 tons on a total of 401,000 tons even the boom year of 1920. The larger exports of the last few months are probably due to the fact that the new American tariffs are to come into operation in the New Year, and States buyers have consequently been purchasing somewhat more extensively than usual. These figures will, no doubt, show a reduction in the immediate future. Still there are sanguine hopes for continuation of the improvement which marked the earlier part of the year, at any rate, though it is very unlikely that the industry will for years, if ever again, absorb its pre-war strength."

Shipping Case at Truro County Court

At the last sitting of the Truro County Court, with Admiralty Jurisdiction, Deputy Judge Lush had before him a claim by William Thomas, of "The Crescent," Truro, owner of the schooner *Olive Branch*, against Charles E. Treffoy, owner of Par Harbour, for £85, damages alleged to have been sustained by plaintiff's schooner. Mr. E. Cunliffe, London, instructed by Mr. L. J. Carlyon, Truro, was for plaintiff, and Mr. J. L. Pratt (instructed by Messrs. Stephens Graham, Wright and Co., Ltd., St. Austell, represented the defendant.

The plaintiff's case was that his schooner was given a berth alongside the quay in Par Harbour. After loading a cargo of china clay bad weather set in, and plaintiff decided to remain until it abated. The weather became worse, and in consequence of the alleged condition of the quay wall, the schooner was forced against a jagged surface, chafing and injuring the side of the boat. A wooden model of the quay and a portion of the schooner was exhibited by Mr. Pratt. Plaintiff admitted that although he might have a log book on board he never used it.

Mr. Pratt: But you have got to keep an official log.

Plaintiff: I have never made an entry in the log all the years that I have had the *Olive Branch*, and I have never been prosecuted for not doing so.

Captain E. Hutchings, marine surveyor, who made an inspection of the schooner, said the "facings" of the quay, which were very old and dilapidated, caused the damage.

Lieut. H. L. Vicary, D.S.C., Harbourmaster of Par, said the gale which blew when the schooner was damaged was the worst known in the district for years. In his opinion, the grass "fender" on the side of the schooner was the cause of the chafing.

The Deputy Judge, after a five-hour sitting, found for the defendant, with costs, on the ground that, although it was his duty to provide a safe berth for vessels using his harbour, he was not in any sense an insurer. Plaintiff had definitely to prove some negligence on defendant's part before he could recover.

A Satisfactory Year

The Times Trade Supplement correspondent says: "It is satisfactory to be able to record that the past year has been the best for the china clay industry since the war, the tonnage handled representing 75 per cent. of the pre-war volume. This result is all the more gratifying because it has been achieved by the export trade, which for the ten months ended October had reached 401,148 tons, against 180,740 tons for the corresponding period last year, and 368,130 tons for the corresponding period of 1920. The total deliveries—home and export—have amounted to 605,645 tons in the ten months, against 273,411 tons last year, eloquent testimony to the recovery of the trade. There are still great opportunities for widening the scope of the markets for china clay. While the use of china clay in large quantities by paper-makers, potters, and manufacturers of cotton goods is well known, there is undoubtedly great scope for its more general use in chemical manufacture. Its cheapness, purity, and whiteness are all in its favour, while the ease with which it assimilates with other chemicals, without deleterious effects upon those chemicals or itself, enhances its value above other and less accommodating raw materials. In the manufacture of alum, china clay is a valuable raw material, and its use seems to have been popular in France."

Our Export Figures

The pages of dissected export figures, showing the several countries of destination, which we published last month, were very much appreciated, and were freely quoted from in contemporaries. We are glad to say that we shall be able to continue these particulars month by month in the future. In discussing these figures the *St. Austell Guardian* says:

"China clay to the value of £2 has been sent to the Fiji Islands, and so recently as October this year. This information, together with a great deal more, is conveyed in a table of unique export statistics relating to china clay in the current issue of *The China Clay Trade Review*. The statistics are remarkable for the fact that not only are given the dissected figures of china clay to every importing country, but they are given for the nine months to September and for the month of October this year as well as for the year 1921. This is the first time that such an exhaustive analysis of china clay exports has been published, and should prove of inestimable value to the industry in the development and cultivation of the export markets.

"It has long since been a matter of common knowledge as to the countries to which our biggest exports have gone, but the lesser importing countries have been lumped together under the general heading 'other foreign countries or British possessions.' From a purely export point of view the figures for the nine months ended September this year are very encouraging, for they show, with a total of 347,729 tons, they are over 100,000 tons better than for the whole of last year.

"Individual figures reveal some interesting facts. Exports to Russia have gone up from *nil* for the whole of last year to 2,105 tons for the nine months this year; Finland has made an increase of 2,000; Sweden and Norway, 6,000; Germany, 2,500; Netherlands, 3,500; Belgium, 11,000; France, 18,000; Spain, 4,000; U.S.A., 55,566. The significance of the increases is all the more gratifying seeing that the comparisons are for nine months against twelve months.

"In addition to six of our Australian States, Egypt, Channel Islands, Ceylon, and New Zealand are amongst other British possessions that figure in the export list. The Indian market has been about equal to last year's trade with about 10,000 tons for the nine months. Other countries represented in the list to a lesser extent are Algeria, Portugal, Greece, Turkey, Morocco, Siam, China, and Japan. Of South American States, Mexico, Colombia, Peru, Chili, Brazil and Argentine are included. These facts show that the distribution of English china clays abroad is much wider than was generally thought, and that the fostering of trade in those countries where china clay is only just beginning to be used is decidedly worth while.

"The statistics also show that of 1,349 tons of china clay imported by us, all but three tons came from the Channel Islands, whence 464 tons have been received for the nine months to September this year. In October this year we received from Czecho-Slovakia 10 tons of china clay, value £112."

Mr. Walter Sessions Interviewed

During the past month Mr. Walter Sessions, one of the managing directors of the English China Clays, Ltd., of St. Austell, returned from a rather long visit to the United States and Canada, and has had some very interesting reminiscences to impart in relation to the business prospects of those countries in the new year. Mr. Sessions found remarkable evidences of activity in all the paper manufacturing areas which he visited, and more would be doing but for the scarcity of labour. I suggested that such a position ought to lend a golden opportunity for the Cornish emigrant. "Yes, one would naturally think so," remarked Mr. Sessions, "but the difficulties to be surmounted are the present restrictions the States Government have placed on emigration; otherwise it would be a good thing for this country." Mr. Sessions thought it was a subject which the British Goverment might take up with advantage and relieve the existing unemployment. As a close observer of the development of the domestic clay mines of America, Mr. Sessions does not mince matters, and realises that great strides are being made in that direction. The American clays can never come up to the value of English clays, but it is the price which operates so competitively against us. He believed that orders would be received for the English clays to an even greater extent than last year, but there must be cheaper production and cheaper distribution before we can hope to recover all our lost markets. In a visit to the pottery area at Trenton and East Liverpool a strike amongst the potters was holding business up, and whilst there were no orders for English clays there was undoubtedly a greater demand for British pottery and earthenware in consequence.

Tramways for China Clay Pits

By China Clay "Captain"

AT the time the tram-waggon was first introduced in the clay-pits (probably there is no one living now who remembers) the wheel-barrow and horse and cart (the cart peculiar to these parts with "ladder-tree" for tipping and cleats and crip-iron removable butt-sides) lingered on in many pits for a long time before tramming on rails became general.

Trams have been used, though, for a great number of years. I remember nearly 30 years ago "cleaning up" what was then considered an *old* clay pit and we found at the bottom (in fairly good state of preservation) a wood frame with iron about 1¼ in. by ¼ in. nailed down to form rails for the waggon to run over, similarly framed to the old longitudinal section of the G.W.R. This goes to show that the benefit of a tramway was recognised even before rails were obtainable, or so plentiful as they are to-day, when practically everything is trammed—the overburthen, the sand, the stent, the clay and mica from the tanks to the kilns, and at some places the dried clay to the truck and the coal to the engines.

Apropos of the above, history records that James Outram, in the year 1775, was the first to substitute cast iron rails in place of wood at some collieries near Sheffield. After a little initial opposition these rails rapidly gained in favour, and under his son Benjamin's management became known as "Outram's-ways." In course of time the first two letters of the name were omitted and the word "tram-ways" evolved.

Selection of Rails

In selecting rails the kind chosen depend upon or vary according to the purpose for which they are required. For the temporary overburthen roads—a line laid down for a few weeks or months, then torn up or "slewed" farther away from the pit's edge—No. 1 section, a rail weighing from 14-18 lb. per lineal yard is very suitable and very often the kind used. These rails are laid down on rough "slab" sleepers, 3 ft. apart—the outside pieces of trees, waste from the saw-mill, sarcastically termed by the Burden-men "bits of bark." Interspersed with good centre and joint sleepers to receive the nails, it makes a good road. If the road is very much curved, section No. 2 is the best rail for bending, especially with a "jim-crow" cold. Not many trammers like this sort though; it's too "kicklish," liable to topple over, requiring too much "fish- plating and dogging" for a temporary tramline.

For a permanent tramway a heavier section is preferable.

Elevation for Curves

The question of how much higher to have the outer rail when rounding a curve—what is known as "cant"—is keenly discussed from time to time, especially if the waggon goes off the track a few times. Some workers contend that the flatter or leveller a curve is laid down the better the waggon will go around it, while others swear by a "high cant." The formula given for a light railway—2 ft. 6 in. gauge—is as follows:

$$E = W\frac{V^2}{1{\cdot}25R}$$

Where E = Super-elevation of outer rail in inches,
W = Width of gauge in feet.
V = Velocity in miles per hour.
R = Radius of curve in feet.

For a Burden-waggon, 2½ ft. gauge, travelling at a walking pace of four miles an hour around a curve of 16 ft. radius—

$$E = \frac{2^2 \times 16}{1{\cdot}25 \times 16} = 2 \text{ inches.}$$

Using the same formula for a "dry"-waggon gauge, 20 in., sharp curve radius (8 ft.) it works out to 2⅝ in. I take it this formula simply allows for centrifugal force—to counteract the "out" thrust, that it may be neutralised and made normal to the earth. In getting a waggon around a curve other factors have to be taken into account, such as revolving or rigid axles. If revolving, bevel wheels should be used. Then, again, the distance between axle centres can make or mar the running. The closer the axles are set together the less the wheels will "bite" the curve.

Dry-waggons 20 in. gauge with axle centres only 18 in. apart will go around much sharper curves than, say, 2 ft. 6 in. gauge waggons with axles 2 ft. 3 in. apart. From observation I should say when the gauge is 2 ft. or under and the axle-centres less than gauge, *half* of the super-elevation given by the above formula would be ample.

Another good point to observe is to have a curve slightly wider, say, ½ in. wider than gauge.

Direction of Run

In laying down a tramline for hand-tramming, if there is any option it should run towards the tip, so that the full waggon may go downhill, but not enough to make it hard to return empties from ¼ in. to ½ in. run per lineal fathom. This is a fair average for easy running trams.

Points

On the temporary tramways, when it becomes necessary to branch off, a "point," known locally as a "metre," is inserted. It may be from 6 to 18 ft., according to width of the road and abruptness of turnout.

It is a very simple affair, just an ordinary rail sharpened at one end and a hole punched through the crown of the rail, a little distance from the other end, to take the metre-pin, for it to pivot about. The sharpened rail (sometimes called pointer as well as metre) forms the right-hand rail of the left branch, and when turned either by the foot or a metre-crook it becomes the left-hand rail of the main or right branch, as the case may be. Why it is called a metre I have not been able to ascertain; perhaps it is a corruption of mitre.

Where a loop is used, self-acting points are in vogue. A weight hung on the point-lever keeps the point closed, so that the waggon may pass one way. Returning, it is forced open by the wheel flange, as soon as it has passed through. The dropping of the weight closes it again automatically. On the permanent roads, with the larger section rails, points are used similar to those in use on the railways.

Next month it is proposed to continue this subject, give sketches of "metre" and swing-bridges, and discuss crossings, etc.

(*To be continued.*)

Hopes for the Future

IN conversation with one of the prominent members of the Association, our St. Austell representative was informed that there was every reason to expect a very prosperous new year in the china clay industry, and will be a marked improvement on the satisfactory recovery achieved in the year that has just passed. Although they were yet far behind the full recovery of their pre-war output the business of 1922 showed a gradual and most gratifying increase since the commencement of the war. The markets for the Cornish clay in many parts of the world had been re-opened, and as the general industrial situation improved so it will be reflected in the increasing demand for our china clay. The American markets, with all her enterprising domestic activities, were still regarded as our best consumers, and although she had been somewhat spasmodic in her purchases since the war our exports have been enormous. During the whole of the lean period which the English producers had passed through the U.S.A. markets had undoubtedly been the preservation of the Cornish industry. Already there were more orders in hand for despatch for January month than for a corresponding period in 1922, and now the prices have been fixed for six months a gradual accession of business is generally anticipated. Manufacturers generally do not purchase the big stocks they used to, but when they once get into their old business stride again the china clay industry of Cornwall and Devon would begin to hum with activity. It is hoped that the political crisis now overhanging the Continent will clear away, as large quantities of our clay are now being sent into both countries affected. Most firms had been directing considerable attention in the development of their works and were desirous to continue to do so with a view to employment, but they cannot be expected except in proportion to the increase in the prosperity of the industry. Anyone with a practical knowledge of the works, especially in the Stenolees and Bugle areas, realises that the development of those deep clay pits entails an enormous expenditure, and can only be achieved by application of labour in extra shifts. It is generally expected that as prosperity returns to the trade so development will increase until all the unemployed, both men and boys, are all absorbed.

Discoveries by Outsiders

How the China Clay Industry has Benefited

WE are glad to see so many of our Editorial comments borne out by Mr. E. J. Hancock's speech at the St. Austell Rotary Club, as reported in the *St. Austell Guardian* :—

At the Rotary Club luncheon Mr. E. J. Hancock paid a tribute which he showed the china clay industry owes to outsiders in the advancement made in the uses of the commodity and the developments introduced in its more economical production.

This recognition of what outsiders have done for the prosperity of the industry is well deserved, though outsiders are sometimes looked at askance by some of those who have, so to speak, been born in the industry. The particular instances referred to by Mr. Hancock can be multiplied both on the sales and the production sides.

Anyone familiar with internal arrangements of the china clayworks cannot help recognising in many directions the hand of the ordinary china clay worker in the simple devices introduced to ensure greater smoothness in the working of the mechanical contrivances. They may be crude and very likely in a few instances would fail to pass muster with the engineers, but they are very effective and accomplish what much more elaborate machinery would do.

The ordinary practical mechanic on the china clay works has many a time shown himself to be a better man in applied mechanics than the trained engineer. A case in point has been the adaptation of a certain class of modern pumping machinery used in some of the newer works. Although this pump is the product of one of the leading engineering firms in the country, it required the practical mechanical sense and ingenuity of an amateur china clay mechanic to make it effective in the production of china clay although the engineering firm was supposed to have adapted it to local requirements.

On the mechanical side many china clay workers have introduced original devices which have contributed very materially to the smooth working of machinery, some of which if discovered by engineering firms, would immediately be protected by the taking out of patents.

The more expert and professional engineer has also, as Mr. Hancock pointed out, contributed to improvements which have added greatly to the productive and economic sides of the industry. Two of the greatest have been those directed to the mechanical washing of clay by hydraulic hoses and to the more economical drying of clay. In the further development of the latter several engineers are bending their efforts, as the number of drying patents that are being filed testify. So far those patents which are adapted for use in the furnace ends of the existing type of dry, have been the most immediately practical and effective, but those working on other plans contemplate drying by less formidable plants than are at present in vogue.

Then there is the application of the mechanical separator principle to china clay production upon which engineers have been working for many years.

The latest development on the production side has been the application of colloidal chemistry to china clay production. The process involves the treatment of china clay produced in the ordinary way by the introduction of special tanks between the washing and the drying processes, the clay while passing through these special tanks being chemically treated and converted into colloidal clay. This clay is a pure commodity, possessing the finest texture and commands a very high price in the commodities in which it is used. The demands for this highly refined clay do not yet appear to be very considerable, but there are great possibilities in its development which the china clay industry as a whole cannot afford to ignore.

In introducing this subject, Mr. Hancock acknowledged that he had been led to that line of inquiry by a certain line that had been taken by the rubber industry in the encouragement of ideas from outsiders in the development of trade. But, unlike the china clay industry, the rubber industry has made it worth while for outsiders to put forward ideas and suggestions for the extension of markets. Last year the Rubber Growers' Association offered prizes ranging from £5,000 to £5 " for ideas and suggestions for extending the present uses or encouraging new uses of rubber." The competition resulted in over 2,000 entries, embodying about 10,000 suggestions, among which were some which the Association found provided substance for development. The suggestions were submitted to a committee of qualified technical men and some of them have resulted in rubber being adapted to a number of new uses.

The china clay industry is suffering from the same complaint as that which led the Rubber Growers' Association to embark upon a generous competition scheme namely, over-production. Now that practically the whole of the china clay industry is supervised by an Association of which nearly all the producers' are members, the Association might very well consider the advisability of adopting a prize scheme on similar lines to that of the Rubber Association. It would be certain to have the effect of attracting many original ideas for the extended use of china clay, and if the scheme were made known among all existing users of china clay, it might lead to valuable hints from workers in those industries. Under present conditions there is no incentive for people with ideas to put them forward though it is known that there are many in embryo which if worked upon might lead to the extended use of china clay.

It would be an excellent sequel to an interesting inquiry if Mr. Hancock, who is a director of the China Clay Association, could induce his co-directors to embark upon some such propaganda as suggested, and thus be the means of bringing the Association into line with other associations which persistently engage in propaganda, in the interests of the extension of the business of their members.

China Clay in Paint Manufacture

OWING to its great oil absorbing power and the fact that it becomes transparent when ground in oil, china clay has not been utilised to the degree it merits in paint manufacture. It does not pay to employ it as an adulterant because a larger quantity of oil is required to mix and grind it than for some really sophisticated pigments. The average specific gravity of china clay is 2·25, and a gallon of bolted or pulverised dry clay weighs 6½ to 6¾ lb. Nearly 4 gal. or 30 lb. of linseed oil are needed to make a stiff paste with the dry clay, and the right consistency for spreading with a brush will be given with 55 of oil and 45 of clay.

When whiting cannot be employed for heavy pigments because the carbonate of lime causes a disintegration of the paint from contact with sulphur gases, or the alkalinity of whiting affects the colour, as happens in the case of Chinese or Prussian blues, china clay will be the best pigment to adopt and is a better suspender than ordinary whiting for heavy pigments. China clay has also been put upon the market under the name of kalsomine for colours like reds, greens and blues, which are not alkali proof. Most liquid fillers for soft woods contain china clay as the only pigment, while it has also been used as a partial pigment for paste hardwood fillers, together with some other white mineral substance or starch. At one time a cheap muslin was prepared by running it through a size made with equal parts of cheap starch and china clay, coloured with aniline dyes. Thus dyed the muslin was run over three heated rollers, giving a fine and well wearing finish.

Quick Dispatch at Fowey

The s.s. *Emilie Maersk* arrived at Fowey on Saturday, December 2. She commenced to load at 8 p.m. on Monday, December 4, and sailed in the early hours of the Thursday morning, December 7, with a full cargo of 3,314 tons, 15 cwt. Taking into account the fact that there was no work done on the Saturday, December 2—as work ceases at 11.30 a.m.—this dispatch is extremely good. This rapid dispatch was mainly due to the combined personal efforts of Mr. Hancock, of West Carclaze, and the ship's brokers, Hobbs, Linsley and Co., Ltd. The steamer was loaded for the account of the West Carclaze China Clay Co., Ltd.

Troy Town

The students of the St. Austell County Secondary School gave a very successful performance in the St. Austell Public Rooms during the Christmas, and on two successive nights the spacious hall was packed with a delighted audience. The major portion of the effort was a dramatic version of " Q's " famous novel, *Troy Town*, in four acts. It was translated from the novel to comedy by H. L. Rowse, the son of a china clay worker, who gained such distinction at the school recently. Sir Arthur Quiller-Couch was present on the first night, and very warmly complimented the youthful artistes on their excellent achievement.

Industrial and Trade Reports

(From Our Own Correspondents and Other Sources).

Great Britain

China Clay Prices

The prices of the lower grades of clay have been reduced for this year by 3s. per ton; that is, for the cheapest clay, and on a graduated scale up to the highest grade, on which there is no reduction whatever. The prices of bags and filling remain the same as at present.

China clay, in bulk, f.o.b. Cornwall, is 32s. to 73s. (highest grade) per ton. The extra charges (including filling), per ton for bags and casks are: Single bags, 9s. 6d.; double bags, 16s. 6d.; half-ton casks, 19s. 6d.; quarter-ton casks, 22s. 6d., in casks, with extra iron hoops, 2s. per ton more.

The Home Paper and Pottery Industries

In a review of conditions during the past year the *World's Paper Trade Review* states that the year began with high prices, lack of trade, idle machinery, unfair foreign competition and crippling contract commitments. It ended with stable prices and a hardening tendency, well filled order books in many cases and satisfactory bookings in most others, diminished foreign competition, vastly increased export figures in terms of tonnage, and smooth business relationships with foreign sources of supply in raw materials. Costs of production have been lowered considerably by diminished post, rail, and coal charges, lower wage rates and increased production. There is still some idle machinery, and it is probably correct to assume that of a possible 100 per cent. production we are not realising more than 75 per cent. There is a long distance to travel before the unemployment returns for the industry are reduced to the fraction at which they should figure. Nevertheless, the fact remains that papermaking takes a foremost place among the industries that have made progress far beyond the expectations formed at the close of 1921.

The prospects for 1923 are good, but not too certain to rouse any great enthusiasm. So much now depends upon an international understanding and the revival of ordinary trading relationship between the various countries that nothing can be considered permanent.

Dealing with the pottery industry, the *Pottery Gazette* states the difficult times are not yet over; in fact, circumstances may arise within the next two years which will call for the exercise of self-restraint on both sides before working conditions become properly balanced and adjusted to post-war requirements. But if in any future negotiations, the same spirit of tolerance is entertained as was evinced during the war and has been extended since there is every reason to hope that we shall get back to something like normal conditions of trading before very long.

North and Midlands

The trade outlook for 1923 in the North and Midlands is without doubt very much better than was the case a year ago, and although the political situation shows no promise of early tranquillity, business men predict an upward move with the general settling down following holiday disturbances.

In the cotton trade the feeling is one of confidence, although some of the weaving mills are still wanting orders, and reports of bumper crops in India are bound to create a feeling that the increased spending power resulting will benefit Lancashire industries.

The pottery trade, although experiencing the usual after Christmas lull, is looking hopefully forward to the future, and a recent reduction in the price of china goods is expected to bring the improvement to Longton which other parts of the pottery district are already enjoying. It must not be forgotten however, that compared with pre-war days the productive power of the Longton china trade has been increased considerably. Ten years ago one could easily have found a dozen or more empty factories, whereas now it would be difficult to find one. The China Manufacturers' Association is a very live force and fully grasping this fact of their increased power of production, are making every effort to discover and open up new markets.

The paper trade is in a much better position than twelve months ago and the feeling of unrest amongst papermakers over contracts for raw materials has now disappeared. There are few machines idle and the outlook is good.

Woollen trade in Bradford district is booming and Sheffield trade is showing decided improvement.

United States of America

The paper industry in the States has been quite active for some little time, and most of the mills are now working full time. This condition is, of course, gratifying to those interested in the importation and distribution of English china clays; on the other hand, the use of domestic clays as paper fillers is becoming more pronounced, especially in Michigan and the Middle West. The increase in the American tariff rates, placing a rate of $2·50 per ton on china clay, is undoubtedly a help to the American clay producer, for the $1·25 tariff increase, together with the remarkable recovery of the sterling exchange rate, is running up the cost of English filler clays to a level which makes competition difficult.

The strike of the employees of the general ware potteries has at last been concluded, after a duration of sixty-six days. This strike affected 7,000 organised employees, and necessarily rendered idle no fewer than 10,000 unorganised workers. It has been estimated that the men have lost $3,000,000 in wages during this term of idleness, while the strike is said to have cost the employers $6,000,000 in possible business. The men are understood to be receiving an increase of 4½ per cent. in their wages, the new agreement running from January 1, 1923, to October 1, 1924.

U.S.A. Clay Prices

The close approach of an inventory period, along with the recent return of ocean freight to the 15s. rate, are reported as a contributing factor to an easier clay market. It is further reported that the present state of the clay market is liable to continue for some weeks, after which it is expected that the wonderful demand which extended over the past four months will again be experienced. Prices continue firm; the latest quotations are as follows:—

English clay, ex steamer, per ton ..	14·00 to 20·00
Domestic clay, washed, per ton ..	8·00 to 10·00
Domestic clay, unwashed:	
No. 1, per ton	6·00 to 7·00
No. 2	5·00 to 6·00

Canada

Canadian China Clay Discovery

Following the recent discovery of a large china clay deposit in the Wood Mountain district of Saskatchewan, a plant is to be established for the manufacture from this clay of dishes, insulators, and other earthenware.

The clay was discovered by Miss Helene Pachal, of Regina, Saskatchewan, and a graduate of the New York School of Ceramics, after a search of some years.

Exhaustive tests, carried out in Medicine Hat, Alberta, and in New York, are reported to have proved that only ten per cent. of outside materials were needed to supplement the clay to make the finest pottery and table dishes, and that it could be made into insulators for high voltage electrical power wires. Miss Pachal has also discovered in Quebec large quantities of felspar and asbestos, the only constituents needed to fuse with her clay to make a perfect china body.

Another Canadian China Clay Co.

Canada is bestirring itself, and attention is drawn to the works of the Canadian China Clay Co. at St. Remi d'Amherst, 85 miles from Montreal. Much of the clay is stained with iron, but there is a deposit of kaolin, which is said to be of pure white colour, and to have, according to Dr. E. M. Wilson, of the Canadian Geological Survey, less iron content than that of the best Cornish clay imported into Canada. Though the present plant is small, the size of the deposit is such that it may ultimately provide for the needs of Eastern Canada, and leave a margin for a substantial export trade.

Sweden

ALL the mills have covered their requirements up to the early spring. The present capacity of the newspaper mills in Sweden is about 185,000 tons a year. This tonnage should call for a requisite proportion of china clay, but the use of this raw material is entirely dependent on the price, as the china clay in newsprint paper can be supplied by mechanical pulp. One of the deciding factors is, therefore, the difference in price between mechanical pulp and china clay. Moreover, account must be taken of the fact that during the war the newspaper mills became accustomed to use talcum instead of china clay, and now, as would be expected, the choice between these two raw materials is entirely a matter of price.

Prices at the present time are so variable that any intelligent forecast is impossible. It is anticipated that the market will be firmer by March.

Although the better classes of printing paper will always require china clay, the present outlook for this paper is not too good. As far as can be ascertained here, the mills do not appear to have orders for more than four weeks ahead, but it is hoped that they will be running at full capacity before long, in which event our china clay shipments to Sweden this year will be bigger than last year.

NYA DAGLIGT ALLEHANDA reports that the decision of the employers in the pulp industry to effect a reduction of 11 per cent. in wages has been followed by fresh strikes at twenty-two pulp mills. The total number of strikers is approximately 4,500. The whole industry numbers ninety mills employing 16,000 to 17,000 hands; one-fourth of the workers are thus already participating in the dispute.

Holland

PAPERMILLS.—The situation in the paper industry has changed very little since last month. There remains a good demand for news and packing paper. According to a new law the mills are allowed to increase the weekly worktime from 45 hours to 48 hours and most mills have now adopted this new working scheme.

TEXTILES.—The prospects for the year 1923 are not unfavourable for the cotton mills.

POTTERIES.—Conditions have not changed since December last year and the prospects for this year are not yet better.

Brazil

INTERESTING PAPER INDUSTRY DEVELOPMENTS

A REPORT received by the U.S. Department of Commerce from its representative at Rio de Janeiro states that a Bill has been introduced in the Brazilian Federal Senate to encourage the establishment in that country of a factory producing printing paper from domestic raw material. The Federal subsidy is to take the form of a loan granted to the first company organised to carry out the purpose of the Bill. The loan is not to exceed 50 per cent. of the total value of the plant, computed on the basis of 650 milreis for each metric ton of annual capacity of the establishment. The loan will bear interest at the rate of 8 per cent. per annum, and must be taken up within ten years after the beginning of operations. The entire amount is to be deposited in the Banco do Brazil to the credit of the firm upon the approval of a detailed prospectus of the plant and estimated cost of installation, the Government taking over a mortgage which runs until the loan is liquidated.

The purpose of the legislation is to encourage the development of the national resources and promote national industries as well as to relieve the present crisis in the printing paper market resulting largely from the depreciation of Brazilian currency.

China

A SPECIAL commissioner from U.S.A. was recently despatched to China, and reported that supplies of high-grade kaolin could possibly be obtained from that country after systematic exploitation. Deposits, he said, are being worked at Foochow, near the South Manchuria railway, and the exports from this centre amount to something like 70,000 tons yearly.

India

SOME IMPORTANT CENTRES OF PRODUCTION

IT is a well-known fact that clays play an important part in the industrial development of a country. In the United Kingdom, clay ranks fourth in value among the mineral products and in the United States the total value of the products manufactured therefrom is more than three times the value of the total Indian mineral output.

The clays found in India are generally classified under four different heads. First there are the common clays, derived largely from the silt of the great rivers and used all over the country for the manufacture of bricks, tiles and the cheaper forms of pottery; next, there are the finer varieties used for glazed pottery, which in place has obtained a reputation for artistic merit; then there are the fire-clays raised in considerable quantities on some of the Gondwana coal-fields, and lastly the Fuller's earth which is mined in the Central Provinces and in Rajputana.

OUTPUT STATISTICS

The quantity mined in the Central Provinces is the largest, being about 40,000 tons; next comes Bengal with 20,000 tons, Bihar and Orissa with 12,000 tons and Burma with 8,000 tons. The total quantity mined in India each year is about 85,000 tons. The clay found in Bihar and Orissa is of a richer quality. In Burma, the most important districts containing clay deposits are in Yamethinwady. The Bengal output is derived from the Myingian, Henzada, Maubin, Pyapon and Hantha-Burdwan districts. In the Central Provinces, the main supply comes from the Jubbulpore district, which has fine quarries in the Upper Gondwanas. The Madras production comes chiefly from the districts of Ganjam, South Kanara, Ramnad, Tinnevelly and Trichinopally. Fuller's earth is obtained at Katni in the Jubbulpore district and a form of Fuller's earth known as "Multani Matti" is worked in the States of Bikaner and Jaisaimer. Marwar has also been a source of steady supply.

EXAMINATION OF SAMPLES

It is beyond doubt that India possesses all the materials necessary for the manufacture of porcelain of highest quality. Some time ago, a series of 95 samples of Indian clays was sent to the Imperial Institute and there subjected to a critical examination. The samples were divided into two groups (1) kaolins, and (2) terra cotta clay. The kaolins were found to be generally of an inferior quality. The terra cotta clays were found suitable for the manufacture of stoneware, ornamental vases and tiles and bricks of good quality.

India's consumption of clay and clay products is larger than her production. The total value of the imports of materials made of clay—namely, earthenware and porcelain, earthenware piping, bricks and tiles, and clay, is about £600,000, which shows that there is considerable scope for the development in the country of industries making use of clay.

Kaolin Deposit near Neckarsteinach

A DEPOSIT of kaolin discovered near Neckarsteinach is said to contain kaolin of excellent quality. Average results of analysis give 8–10 per cent. water, 52–60 per cent. silica, 25–30 per cent. alumina, 0·8–2·0 per cent. iron oxide, 0·3–0·6 per cent. lime, 0·8–1·3 per cent. magnesia, and 1·2–4·9 per cent. alkalis. Washings of the material at various depths gave the following results:—

Material.	Moisture. Per cent.	Coarse sand (over 250-mesh) Per cent.	Fine sand (through 250-mesh) Per cent.	Washed Kaolin. Per cent.	Ratio Kaolin to sand.
At depth of about 2 m.	14·9	49	18	16	20 : 80
At depth of about 3 m.	13·0	2·3	52	32	37 : 63
At depth of about 4 m.	15·3	3·0	41	39	47 : 53

Classification of Silicates

Characteristics of Commercial Clays

IN *The Science and Art of Mining*, Mr. Fredk. C. Short has an interesting article on the above subject and from which we have abstracted the following :—

Of the numerous and highly complex compounds which may be regarded as derived from silicic acid by the replacement of its hydrogen with metals and are known as *silicates*, by far the largest proportion occur in nature as distinct mineral species, and they are among the chief constituents of each of the three great rock groups—sedimentary, igneous and metamorphic. *Clays* appear to consist essentially of one or more alumino-silicates ; the *micas* are complex silicates of aluminium along with iron, magnesium, or the alkali metals ; *felspars* are aluminium silicates associated with sodium, potassium and calcium ; the common mineral *olivine* is a magnesium silicate ; *enstatite*, widely distributed in lavas, is a silicate of magnesium and iron ; *augite*, which is abundant in crystalline igneous rocks, is a silicate of calcium and magnesium, and *hornblende*, which closely resembles augite, is a complex silicate of calcium, magnesium, aluminium and iron.

The present state of knowledge of these important and widely distributed compounds is very limited and attempts to classify them chemically are largely speculative. One of the most convenient systems for their chemical classification, however, consists in referring them to a series of hypothetical silicic acids as indicated in the following table :—

Name.	Acid.	Silicate.			
		Mono.	Di.	Tri.	Poly.
Meta ..	H_2O,SiO_2	M_2O,SiO_2	$M_2O,2SiO_2$	$M_2O,3SiO_2$	$M_2O,nSiO_2$
Ortho..	$2H_2O,SiO_2$	$2M_2O,SiO_2$	$2M_2O,2SiO_2$	$2M_2O,3SiO_2$	$2M_2O,nSiO_2$
Para...	$3H_2O,SiO_2$	$3M_2O,SiO_2$	$3M_2O,2SiO_2$	$3M_2O,3SiO_2$	$3M_2O,nSiO_2$
	etc.	etc.	etc.	etc.	etc.
	Where M represents a monovalent metallic atom.				

The application of this system of nomenclature in the case of a few well-known mineral silicates will serve to explain its use.

Thus, wollastonite $=CaSiO_3=CaO, SiO_2$=calcium metamono silicate ;

olivine $=Mg_2SiO_4=2MgO, SiO_2$=magnesium ortho-monosilicate ;

serpentine $=Mg_3Si_2O_7=3MgO, 2SiO_2$ = magnesium paradisilicate ;

etc., etc.

The numerous complex silicates of aluminium with other bases are more conveniently classified as derivatives of hypothetical alumino silicic acids :—

Alumino monosilicic acid	Al_2O_3, SiO_2, nH_2O.
Alumino disilicic acid	$Al_2O_3, 2SiO_2, nH_2O$.
Alumino trisilicic acid	$Al_2O_3, 3SiO_2, nH_2O$.
Alumino tetrasilicic acid	$Al_2O_3, 4SiO_2, nH_2O$.

etc.

Thus, kaolinite $Al_2O_3, 2SiO_2, 2H_2O$= Alumino disilicic acid ;

anorthite or lime felspar $Al_2O_3, 2SiO_2, CaO$=Calcium alumino-disilicate ;

Potash felspar $Al_2O_3, 6SiO_2, K_2O$ =Potassium alumino-hexasilicate ;

Emerald $Al_2O_3, 6SiO_2, 3BeO$=Beryllium alumino-hexasilicate.

The materials termed "clays" by geologists comprise mixtures of clays and other minerals which are the result of the decomposition of granite rocks by the process known as weathering. The geological classification is not entirely satisfactory from the chemical standpoint, which defines a clay as a complex alumino-silicate. The principal commercially important clays are—

Ball clays.—White burning clays characterised by great plasticity, and used for the manufacture of earthenware and stoneware.

Boulder clay.—Clays deposited by glacial action and used for the manufacture of bricks and roofing tiles.

Brick clays.—Sandy clays specially suited for brick-making.

Cement clays.—Highly siliceous clays specially suitable for the manufacture of Portland cement.

China clay.—A white-burning clay of low plasticity, used for the manufacture of china and porcelain and for filling paper, cotton, etc.

Crucible clays.—Selected fire-clays used for the manufacture of crucibles.

Fire-clays.—Clays which offer considerable resistance to the action of heat and exhibit but slight shrinkage on drying.

Fuller's Earth.—An earthy matter which will absorb grease and is not unlike china clay.

Ganister.—A mineral consisting of silica mixed with one-tenth its weight of clay and much used for making siliceous fire-bricks and for lining furnaces.

Grog.—A burnt clay added to raw clay to prevent shrinkage.

Loams.—Mixtures of clay and sand used for brick and tile making.

Marls.—Mixtures of clay and chalk used for the manufacture of cements.

Pipe clay.—A term applied to all whitish clays.

Red-burning clays.—Clays whose colour is due to the presence of iron compounds, and which are used for the manufacture of bricks, files, and terra-cotta.

Yellow-burning clays.—Usually fire-clays used for brick making.

Clays are characterised by more or less *plasticity*, a property which enables them to be readily moulded into any desired shape. The experienced potter ascertains the relative plasticity of a number of clays by "feeling" them, but it does not appear to be a property capable of accurate measurement. Another characteristic of a clay is the shrinkage it undergoes on being allowed to dry. What appears to take place is the evaporation of the film of water which separates its particles, after which the particles draw together into intimate contact. The chemical constitution of a natural clay cannot be ascertained with entire accuracy, but when the purest clays are examined they are found to approximate to the composition represented by the formula

$$H_4Al_2Si_2O_9,$$

though the true molecular formula is probably six times this. Asch's theory of the constitution of a clay, the evidence in favour of which is very strong, regards it as a ring compound analogous with the organic cyclic compounds.

Company News

ENGLISH CHINA CLAYS.—The directors announce a dividend on the preference shares of 3½ per cent. for the half-year ended June 30, 1921.

PENRICE CHINA CLAY CO., LTD., Copperhouse, Hayle, Cornwall.—This private company has been registered to carry on the business of china clay producers and china clay merchants. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors : A. Daniels, Bignall End Cottage, Newcastle ; and T. A. Pool, 1, Bodriggy Villas, Hayle, Cornwall. Qualification of directors, £100. Remuneration of directors to be voted by company.

A New British Patent

TREATMENT OF CLAY.—No. 31099/21 (addition to 184271).—W. Feldenheimer, 20, Holborn Viaduct, and W. W. Plowman, 83, St. Leonard's Road, East Sheen, Surrey. A modification in the process for the treatment of clay set out in the parent specification consists in using as a deflocculating-agent a dilute aqueous solution containing the pyro-phosphate of an alkali base—for example, sodium pyro-phosphate. The clay may be subsequently recovered from its suspension by the process of flocculation described in Specification 121191 or otherwise.

Shipping and Export News of the Month

Fowey Shipping—December 1922

Arrived.		Vessel's Name.	Sailed.	
Dec. 1,	S.S.	*Brier Rose*	Dec. 2,	Weston Point
Dec. 2,	S.S.	*Emile Maersk*	Dec. 7,	Portland Me.
Dec. 2,	S.S.	*Guardian*	Dec. 7,	Weston Point
Dec. 3,	S.S.	*Kelbergen*	Dec. 13,	Philadelphia
Dec. 3,	S.S.	*English Rose*	Dec. 7,	Gravesend
Dec. 4,	M.V.	*Margot*	Dec. 8,	Rochester
Dec. 4,	S.S.	*Spaarnestroom*	Dec. 8,	Amsterdam
Dec. 4,	S.S.	*N. Hansen*	Dec. 14,	Berwick
Dec. 5,	S.S.	*Rosabelle*	Dec. 9,	Preston
Dec. 5,	S.S.	*Multistone*	Dec. 8,	Granton
Dec. 5,	S.S.	*Mersey*	Dec. 7,	Preston
Dec. 5,	S.S.	*Hamlet*	Dec. 9,	Goole
Dec. 6,	S.S.	*Broadgreen*	Dec. 9,	Brussels
Dec. 6,		*Hilda*		—
Dec. 7,	S.S.	*Gorilla*	Dec. 9,	Liverpool
Dec. 7,	S.S.	*Mary Ann*		—
Dec. 8,	S.S.	*Farfield*	Dec. 9,	Ridham
Dec. 8,	S.S.	*T. W. Stuart*	Dec. 9,	Northfleet
Dec. 8,	S.S.	*Lowland Firth*	Dec. 15,	Glasgow
Dec. 9,	S.S.	*Falmouth Castle*	Dec. 12,	Weston Point
Dec. 9,	S.S.	*Cornish Trader*	Dec. 13,	Brussels
Dec. 10,	S.S.	*Robrix*	Dec. 13,	Gravesend
Dec. 10,	S.S.	*Tenbergen*	Dec. 20,	Boston, Mass.
Dec. 10,	M.V.	*Alfa*	Dec. 14,	Leith
Dec. 10,		*Mary Barrow*	Dec. 27,	Rochester
Dec. 10,	S.S.	*Mellanear*	Dec. 12,	Grimsby
Dec. 10,	S.S.	*River Trent*	Dec. 28,	Portland Me.
Dec. 11,	S.S.	*Cromarty Firth*	Dec. 14,	Antwerp
Dec. 12,	S.S.	*B.W.III.*	Dec. 15,	Antwerp
Dec. 12,	S.S.	*Evelyn Manor*	Dec. 18,	Aberdeen
Dec. 13,	S.S.	*Kingstown*	Dec. 18,	Swansea
Dec. 13,	S.S.	*Pansy*	Dec. 15,	Preston
Dec. 13,		*Bidsie and Bell*		—
Dec. 13,	S.S.	*Freighter*	Dec. 18,	Tyne
Dec. 13,	S.S.	*Fingal*	Dec. 16,	Leith
Dec. 14,	S.S.	*Norden*	Jan. 3,	Leith
Dec. 14,	S.S.	*Ebbrix*	Dec. 18,	Ridham
Dec. 14,	S.S.	*Quaysider*	Dec. 19,	Rouen
Dec. 14,		*Western Lass*	Dec. 15,	Par
Dec. 14,	S.S.	*Joffre Rose*	Dec. 19,	Weston Point
Dec. 14,		*Rhoda Mary*	Dec. 18,	Looe
Dec. 16,	S.S.	*Rigmor*	Dec. 22,	Genoa
Dec. 16,	S.S.	*Brier Rose*	Dec. 20,	Preston
Dec. 16,	S.S.	*Moss Rose*	Dec. 21,	Fleetwood
Dec. 16,	S.S.	*Merwestroom*	Dec. 28,	Amsterdam
Dec. 16,		*Albert*	Jan. 3,	Gothenborg
Dec. 18,		*Neptun*	Jan. 2,	Tayport
Dec. 18,	S.S.	*Amfred*	Dec. 22,	Antwerp
Dec. 18,	S.S.	*Riposto*	Jan. 2,	Genoa
Dec. 15,	S.S.	*Allerwash*	Dec. 19,	Hull
Dec. 19,	S.S.	*Overton*	Dec. 21,	Ridham
Dec. 20,	S.S.	*Spinner*	Dec. 29,	Rouen
Dec. 21,		*Western Lass*	Jan. 4,	Runcorn
Dec. 21,		*Lizzie Trenberth*		—
Dec. 21,	S.S.	*Broadway*	Dec. 29,	Rotterdam
Dec. 21,	S.S.	*Seaforth*	Dec. 23,	Newport
Dec. 23,	S.	*Wilhelm Biesterfield*	Dec. 22,	Brussels
Dec. 25,	S.S.	*Kylebute*	Dec. 29,	Newlyn
Dec. 26,	S.S.	*Rytoner*	Dec. 29,	Ridham
Dec. 26,	S.S.	*Macville*	Jan. 2,	Brussels
Dec. 30,	S.S.	*Mellanear*	Jan. 3,	Grimsby
Dec. 31,	S.S.	*Magrix*	Jan. 3,	Gravesend
Dec. 31,	S.S.	*Westdale*	Jan. 4,	Ridham
Dec. 31,	S.S.	*Guelder Rose*	Jan. 4,	Preston
Dec. 31,	S.S.	*Primrose*	Jan. 3,	Preston

Par Harbour Shipping, December 1922

Arrivals

Date.		Vessel's Name.	From.
December 2	M.V.	*Isabel*	Plymouth
December 3		*J.N.R.*	Plymouth
December 3		*Eclipse*	Plymouth
December 4		*Lily*	Cowes (I.O.W.)
December 5	M.V.	*P.H.E.*	Plymouth
December 6	S.S.	*Holmwood*	Penzance
December 7		*Daisy*	London
December 7	M.V.	*Phœnix*	Plymouth
December 8		*Buttercup*	Falmouth
December 8	M.V.	*Rival*	Falmouth
December 9		*Fanny Crossfield*	Bridport
December 9	M.V.	*P.H.E.*	Plymouth
December 9		*Perseverance*	Helford River
December 15		*Western Lass*	Fowey
December 17	M.V.	*Eilien*	Falmouth
December 27		*Ofelia*	Newlyn

Sailings

Date.		Vessel's Name.	Destination.
December 2		*Regina*	Pentewan
December 2	M.V.	*Isabel*	Pentewan
December 4		*M.A. Mandell*	Runcorn
December 5		*Snowflake*	Runcorn
December 5		*J.N.R.*	Plymouth
December 5		*Eclipse*	Plymouth
December 6	M.V.	*P.H.E.*	Pentewan
December 8	M.V.	*Phœnix*	Pentewan
December 8		*Lily*	Boston
December 7	S.S.	*Holmwood*	Western Point
December 9		*Lilla*	Ardrossen
December 9	M.V.	*Rival*	Plymouth
December 16	M.V.	*P.H.E.*	Plymouth
December 21		*Fanny Crossfield*	Dunkirk
December 21		*Lizzie Tremberth*	Runcorn
December 21		*Perseverance*	London
December 21		*Western Lass*	Runcorn
December 24	M.V.	*Eilien*	Western Point
December 31		*Ofelia*	Inverkuthing

Charlestown Shipping

Date.	Name of Vessel.	Destination.
December 2	*Lucy Richmond*	Erith
December 7	*Challenger*	Rochester
December 14	*Christiania*	Manchester
December 16	*John Sims*	Antwerp
December 16	*Rose Mysterieuse*	Rocheford
December 20	*Aguna II.*	Antwerp
December 23	*Camm*	Gravesend

Penzance Shipping

Date.	Name of Vessel.	Destination.
December 19	*Ubbergeu*	Philadelphia.

Par Harbour Tide Table, January 1923

(Greenwich Mean Time throughout.)

Day of Week.	Day of Month.	Morning.	Afternoon.	Height.
Monday	1	3.54	4.16	11.10
Tuesday	2	4.36	4.57	12.4
Wednesday	3	5.19	5.41	12.9
Thursday	4	6.2	6.22	12.11
Friday	5	6.32	7.2	13.1
Saturday	6	7.21	7.42	13.0
SUNDAY	7	8.2	8.24	12.9
Monday	8	8.48	9.13	12.4
Tuesday	9	9.38	10.5	11.9
Wednesday	10	10.34	11.6	11.2
Thursday	11	11.39	—	10.9
Friday	12	0.15	0.51	10.8
Saturday	13	1.29	2.7	11.1
SUNDAY	14	2.43	3.17	11.8
Monday	15	3.47	4.15	12.3
Tuesday	16	4.39	5.2	12.8
Wednesday	17	5.23	5.43	12.9
Thursday	18	6.3	6.23	12.11
Friday	19	6.42	7.1	12.11
Saturday	20	7.19	7.36	12.7
SUNDAY	21	7.32	8.7	12.3
Monday	22	8.22	8.37	11.9
Tuesday	23	8.54	9.12	11.2
Wednesday	24	9.30	9.49	10.7
Thursday	25	10.10	10.34	10.0
Friday	26	11.2	11.35	9.6
Saturday	27	—	0.11	9.6
SUNDAY	28	0.51	1.30	9.10
Monday	29	2.8	2.42	10.6
Tuesday	30	3.13	3.42	11.5
Wednesday	31	4.9	4.34	12.3

H. L. VICARY, Harbour Master.

Registered Exports of China Clay

PARTICULARS are given below of the registered exports of china clay, including Cornish or china stone, the produce of the United Kingdom, from the United Kingdom to each country of destination, during the months of November and December, 1922 :—

NOVEMBER

Country of Destination.	Quantity. Tons.	Value. £
Finland	864	1,624
Esthonia	427	705
Sweden	1,827	3,992
Norway	1,646	3,485
Denmark	361	1,260
Germany	914	2,284
Netherlands	3,678	9,329
Belgium	7,365	15,720
France	3,051	1,201
Portugal	25	109
Spain	855	3,177
Italy	27	81
China	2	8
United States of America—on the Atlantic	39,105	94,354
United States of America—on the Pacific	370	1,457
Brazil	10	41
Argentine Republic	100	450
Cape of Good Hope	—	3
Bombay *via* other Ports	1,287	5,352
Bengal	157	692
Victoria	5	20
New South Wales	18	158
Canada—on the Atlantic	2,640	6,273
Total	64,734	156,775

DECEMBER

Country of Destination.	Quantity. Tons.	Value. £
Esthonia	278	458
Sweden	447	670
Norway	1,007	1,833
Denmark	2	3
Germany	1,499	3,147
Netherlands	1,529	3,835
Belgium	3,315	7,357
France	2,858	6,822
Switzerland	16	45
Portugal	14	61
Spain	10	75
Italy	3,508	8,909
China	2	10
United States, Atlantic	21,982	50,574
Bombay, via Karachi	21	78
Bombay, via Other Ports	1,021	4,078
Madras	62	248
Victoria	2	22
New South Wales	10	50
New Zealand	—	3
Canada, Atlantic	23	146
Total	37,606	88,424

December China Clay Exports

FROM the "Accounts Relating to Trade and Navigation of the United Kingdom" (Overseas only).

	QUANTITIES.					
	Month ended December 31.			Year ended December 31.		
	1920.	1921.	1922.	1920.	1921.	1922.
CLAY.						
China Clay (including Cornish or China Stone)..	44,973	29,222	37,606	495,802	246,682	503,488
Fireclay .	1,192	893	1,342	17,544	10,909	13,812
All other Sorts ..	6,884	4,388	13,401	79,400	67,712	77,012

	VALUE.					
	Month ended December 31.			Year ended December 31.		
	1920.	1921.	1922.	1920.	1921.	1922.
CLAY.						
China Clay (including Cornish or China Stone)..	£ 138,969	£ 78,577	£ 88,424	£ 1,450,685	£ 731,450	£ 1,296,426
Fireclay .	4,243	2,553	2,481	53,856	36,304	34,367
All other Sorts ..	21,448	12,758	31,178	231,824	188,830	196,534

China Clay Industry Revival

1922 Best Year since 1914

THE returns of total china clay deliveries for December amount to nearly 60,000 tons, bringing the total for the year up to nearly 740,000 tons, compared with a total of 350,000 tons in 1921 and 900,000 tons in 1912. Here are the details of deliveries from the Cornish and Devon ports and by rail :

	Tons.
Fowey	49,367
St. Blazey	1,015
Par	2,280
Charlestown	1,526
Plymouth	145
Newham	243
Penzance	2,600
By rail	3,108
	60,284

Compared with 74,500 tons for November, the record month for the year was October, with 76,324 tons, and the lowest February, with 48,028 tons. The year's total of deliveries to home and foreign markets just touched 740,000 tons. The records as to exports only will be found elsewhere in this issue.

Development of St. Austell Bay

THE *St. Austell Guardian* correspondent says there are prospects for the development of the magnificent seaboard possessed by St. Austell Bay from Par to Mevagissey. I have already made reference to the ambitious scheme that Tregrehan Estate has in hand for the development of that magnificent stretch of coast-line from Crinnis to Charlestown. I hear that the interest of the G.W.R. is being enlisted in the scheme and that in the spring a commencement will be made. Now that a new spirit of enterprise animates the G.W.R., let us hope that their chairman, Viscount Churchill, and their general manager, Mr. Pole, may soon consider the sweep of country from Par to Mevagissey worthy of a survey with a view to something being done in the way of facilities of locomotion in the opening up of this locality. It is surprising to me that the G.W.R., while developing remote places in Cornwall, have shown such neglect of a stretch of coast which could be made to respond so quickly to development. Now that they are showing a disposition to co-operate in the Crinnis proposal, they may be disposed to consider the possibilities of other places adjacent to the Bay.

English China Clay Prices

CHINA clay, in bulk, f.o.b. Cornwall, 32s. to 73s. (highest grade) per ton. The extra charges (including filling), per ton for bags and casks are : Single bags, 9s. 6d. ; double bags, 16s. 6d. ; half-ton casks, 19s. 6d. ; quarter-ton casks, 22s. 6d. ; in casks, with extra iron hoops, 2s. per ton more.

The China Clay Trade Review

The Official Organ of the China Clay Industry and the only Journal specially devoted to its interests. Published in the third issue of "The Chemical Age" each month.

All Editorial communications should be addressed to the Editor, "The China Clay Trade Review," Benn Brothers, Ltd., 8, Bouverie Street, London, E.C.2. All communications relating to Advertisements, Subscriptions, and other business should be sent to the Manager, "The China Clay Trade Review," at the same address. Telegrams—"Allangas, Fleet, London." Telephone—City 9852 (6 lines).

Contents

A Promising Month

JANUARY has started the year well for the china clay industry, for with a total tonnage of over 74,000 delivered during the month, it comes within a couple of thousand tons of the record month of last year. There were several factors that justified the belief held by many producers that after a period of briskness such as characterised 1922, there would be a lull in the markets in the early part of the new year. One was the coming into effect of the new United States tariff, and the other the beginning-of-the-year slackness that generally follows the holidays, plus the poor weather conditions for shipping. This briskness in the first month of the year is therefore all the more gratifying, because it shows that the revival in the industry is a steadily growing one.

The demand that has led to this result appears to be fairly general. The American market has maintained its demand over the year end. The Continental markets, especially those in Northern Europe—notably Belgium—have shown a brisk demand, especially for the cheaper classes of clays, which happen to be regaining their old markets, despite the war-fostered competition of certain foreign domestic clays. The home market, too, has been showing increased activity, especially in paper and bleaching clays.

The growing firmness in the overseas markets is giving great satisfaction to English China Clay producers, emphasising as it does that importers cannot satisfy their needs to any great extent from domestic supplies. There has been a great deal made recently of the kaolin deposits in other countries. In the main our home producers have little to fear from them because their development—even in areas where the deposits may be extensive and of fair quality—on account of their remoteness from railways and seaboard—preclude them from competing effectually with the cheap, inexhaustible supplies of Cornwall and Devon. To prove how serious this drawback must be to the present day successful development of these china clays, even concerns in Cornwall and Devon have come to grief because their deposits, admittedly good in quality and quantity, have involved too great a capital outlay on transport facilities at the outset and heavy running expenses afterwards; whereas their neighbours have been more favourably placed.

On the strength of the prosperity of the British China Clays, financiers and concessionnaires will doubtless be exploiting these deposits in foreign countries, but they will have their work cut out in competing with an old established industry, with plant and works erected at pre-war prices, and producing a commodity which, taking quantity with quality, cannot be surpassed. With foreign kaolin producing firms already established the case is slightly different, the most important being those of Czecho-Slovakia, and the American clays of Georgia and Virginia. Neither attains the high standard of English clays, and, except for demands near home, have heavy transport costs to handicap them in competing further afield with English clays.

Improved Methods of Production

IN another part of this Supplement we publish an article on "The Drying of China Clay" by a new process, which will be of interest to many producers, even though they may not agree with the principles evolved. China Clay producers are constantly seeking to improve the present system of drying, and some firms have very successfully reduced their expenses and increased the drying capacity of their kilns by carefully thought-out experimental work which has involved both time and outlay, but which has well repaid their efforts.

The old average of ten tons of dried clay to one ton of coal has now been considerably exceeded by several firms, but we are quite sure that any practical method of reducing costs and increasing output either in the dries, or with the more economical use of pumping machinery, or in improved transport methods will be welcomed by the trade. We purposely emphasise the words "practical methods" because of the number of wonderful inventions of recent years which have been introduced by those having no practical knowledge of the trade, and who often invite producers to share the expenses of installing costly and elaborate plants which lead to nothing more than expense and much disappointment to all involved. While we agree with Mr. E. J. Hancock that many of the improvements which have been introduced to the trade have originated from "outsiders," we cannot help wishing that some of the inventors who seek to introduce novel methods to the trade (and incidentally make their own fortunes) would in the first place take the trouble to acquaint themselves with the practical side of the industry before asking producers to try out their schemes.

THE CHINA CLAY TRADE REVIEW is always glad to give publicity to any new invention which may prove to be of use to the trade. It may be, as in the case of some well-known pumps now being used, that a slight adaptation made by a practical China Clay worker would make the invention a workable proposition. For this reason, if for no other, we shall be glad from time to time to publish reports of mechanical appliances which may be offered to the trade. If practical readers find some of these inventions of little use, we would ask their indulgence, with the hope that out of many published some may be of real utility.

America and China Clay

WE have frequently drawn attention in these columns to the development of China Clay properties in America, and while it may be a fact that our friends across the water will always have to purchase "best" clays from us, it is interesting to note that at the experimental mining station at Columbus, Ohio, a special section is devoted to Kaolin investigation. The laboratories and offices of the station are housed in a building containing the mining engineering, metallurgical and ceramic laboratories of the University of Ohio. A two-story addition and a kiln house have been erected for the use of the station. The first floor contains two general laboratories, a machine shop, and a pottery laboratory. On the second floor are offices, a drafting room, an optical and chemical laboratory, and an electric furnace laboratory.

In the laboratory in the west basement are a dry pan, pug mill, and moulding machine, bins for storing crude and screened clay, a screen and two bucket elevators for conveying the crushed clay from the dry pan to the screen, and the screened clay from the bin to the pug mill. Provision has been made for driving this machinery with two 30 horse-power motors. One drives the dry pan, elevators, and pug mill, and the other is connected to the moulding machine. This arrangement gives flexibility and permits tests being made on the moulding machine independently, as, for example, in determining the power required for moulding stiff mud clay products, a subject on which no reliable data exist. This machinery, with the tunnel driers and large kiln, also permits tests of clays on a scale comparable with that of small commercial plants.

In connection with the work on Kaolins, two investigations are at present under way at the bureau. These relate to the use of sulphuric acid and the sedimentation of clays and the use of American clays as fillers for oilcloth. Experimental work is undoubtedly being undertaken by individual English China Clay producers at the present time, but we should like to have seen the "Associated" take up the investigation of China Clays and their uses for the benefit of the trade as a whole.

Properties of Stoneware Clays

IN the U.S.A. during the war an unusual demand for chemical stoneware arose from the manufacture of dyestuffs, of ingredients for poisonous gases and explosives, and of other chemicals. A study of the properties of stoneware clays of Ohio and Pennsylvania was begun, chiefly to call attention to valuable stoneware clays not widely used and to show how their qualities could be improved by inexpensive physical and chemical treatment. Over 50 per cent. of the China Clay or Kaolin used in the pottery, paper and oilcloth industries of America in normal times is imported from England. Although there are large quantities of Kaolin in the United States, consumers of this commodity claim that the American producers are unable to deliver a product that is comparable with the English.

In the manufacture of the better grades of pottery, the American Kaolins either do not give ware of good colour or else cause high bisque losses. The principal objections to the use of their domestic Kaolins as fillers in the paper and oilcloth industries are that they do not give good spreading qualities and wear out the machinery rapidly. The workable Kaolin deposits east of the Mississippi River are being investigated by engineers of the bureau. At each deposit data have been collected on its extent and structure, its location and accessibility, and the methods of mining and refining used. Samples have been collected and sent to the Columbus station, where experiments in refining and blending will be conducted with the object of producing a clay equal to imported varieties.

Colloidal Clay

Interesting Developments at St. Austell

THE production of colloidal clay in Cornwall has not been on a very extensive scale up to the present, although its advantages and possibilities in regard to certain manufactures must eventually be widely appreciated. The preparation of such a highly purified article is not only an intricate process but it is understood to be a most expensive one, and only suitable clays can be utilised. Considerable interest will, therefore, be aroused in the industry in view of the announcement that English China Clays, Ltd., of St. Austell, have been making highly satisfactory experiments in the purification of clays on a large scale.

Results of Experiments

Those engaged in the industry, and particularly those associated with the various China Clay mines of the English China Clay, Ltd., in the district of Nanpean, have evinced such keen interest in this innovation that a representative of THE CHINA CLAY TRADE REVIEW sought an interview with Mr. T. Medland Stocker, J.P., one of the managing directors of the English China Clays, Ltd., on the subject. In reply to a question as to whether the English China Clays, Ltd., were contemplating the production of colloidal clay, Mr. Stocker said that the firm and its predecessors had been for the past ten years making experiments with a view to the placing on the market a highly-purified clay. The term "colloidal," Mr. Stocker remarked, had been rather incorrectly used, and he preferred that the term should be "somewhat approaching to the colloidal state." Many thousands of experiments have been going on in the laboratory of the firm during the last few years. As a result, English China Clays, Ltd., have now succeeded in producing a very highly-purified clay. The late Count Schiverin, of Frankfort-on-Main, the eminent German chemist, was much interested in the purification of clays, and visited Cornwall during the early summer of 1914, and as far back as 1911, when he made a tour of the various mines of the firm. Count Schiverin patented various processes, some of which the English China Clays, Ltd., now intend to use under license.

Two Grades of Material

"Is it the intention of the firm to place more than one kind of this purified clay on the market?" queried our representative; to which Mr. Stocker replied in the affirmative, and said that they were putting two kinds of this refined raw material on the market. The sample of colloidal clay shewn our representative surpassed in fineness of grain anything that he (Mr. Stocker) had seen. It is obvious this clay will be very costly to prepare, and consequently consumers will be obliged to pay a correspondingly high figure. The second grade, which is to be introduced, when compared with the ordinary clays, will be found to have qualities that are not usual in the general commercial clays. The powers of this clay to remain in suspension as compared with other commercial kinds are very different, and the flotation and other tests demonstrate its peculiar qualities. Asked whether there would be a demand for those clays in the manufacture of paper or pottery, Mr. Stocker replied that the best sample could not be regarded as better than the ordinary commercial clays, either in common paper or common pottery; but the firm have in view other and entirely different markets for their best product. Their second brand may possibly be used somewhat in the manufacture of paper, and also of pottery, to advantage. The No. 1 brand is certainly unique, and will eventually be largely used, although it is not anticipated that the markets will absorb any considerable quantity for some time yet. It is hoped that when the demand does come it will add very considerably to the employment in the clay industry. It is expected that these clays will be used as a substitution for other high priced materials. The whole process is very intricate and involves great care; and various clays used yield such different result that many are not worth the cost of treatment. It must be very gratifying to all concerned in the future prosperity of the China Clay trade to find that the English China Clays, Ltd., a firm with facilities for producing half a million tons of China Clay per annum, are once more demonstrating their initiative in the development of the industry by penetrating into other channels for the outlet of the business; in their endeavours the whole community will express its heartiest commendation.

China Clay Business

Modern Production and Selling Methods Described

WITH so many new readers interested in China Clay added to those who previously subscribed to THE CHINA CLAY TRADE REVIEW, the time is opportune for some observations, in the interests of both buyers and purchasers, on the various methods in vogue for the sale and dispatch of China Clay.

There are in all approximately 200 individual quarries in Cornwall and Devon engaged in the production of China Clay and china stone, the latter being small when compared with the output of China Clay. Of these 200, some 182 are China Clay quarries, over 170 of them being in operation in Cornwall. The balance of 18 china stone quarries are all operated in Cornwall. There are many individual companies working one or two quarries, but the majority of works are operated by about a dozen big companies who, however, manage the works separately.

The Producers' Association

With the exception of a few of the smaller firms the producers are members of the trade association, known as Associated China Clays, Ltd. While having no control over the management and internal affairs of individual firms, all of which carry on their business independently of it, the Association administers, through a Board of Directors appointed from amongst the producers, the affairs of the industry that are mutually beneficial. One of its functions is the maintenance of the prices fixed at intervals by the producers themselves, and based on a fair return on capital and the payment of a living wage to the workers. The Associated China Clays is not a "trust" or "combine"; it does not throttle competition. It does not standardise individual firms and compel them to conform to a hard and fast line; every firm is free to sell its clays where and when it likes, without disclosing to the Association the names of its customers, or the destination of cargoes. All that members are required to do is to make a return to the Association of the quantities dispatched, the qualities and the prices.

Grading of Clays

As was hinted in our last issue, the clays of every producer are sampled by the Association and the price fixed upon them according to the grade they are in. There are dozens of different grades of China Clay, which come under the general classification of bleaching—best, medium, common; potting—best, medium, common. Under each of these sections the various clays are graded and priced according to quality. The test for bleaching—*i.e.*, paper and cotton, is generally that of body and colour; for potting, that of firing. Included under both classes—bleaching and potting—are clays suitable for chemical purposes, but so far as the Association is concerned they are not treated for price on a chemical basis, though the Association and individual firms will furnish chemical analyses of any particular clays that may be asked for by buyers.

Individual firms have a perfectly free hand in the sale of their own clays, but the Association also undertakes the sale of members' clays. Some buyers were at first a little shy of the Association when it came into being at the end of 1917, but experience has shown that it has justified itself in the perfect organisation it now possesses for insuring regular supplies, the production of well-washed clays, the maintenance of clays in particular grades at a uniform level of quality; and a uniform form of contract for the sale of clay, the terms of which the buyer and seller thoroughly understand.

Every China Clay producer is at liberty to sell his clay where he likes provided he conforms to the regulations of the Association which have been indicated. All prices are based on f.o.b. Fowey, the bulk of the sea-borne deliveries of China Clay being from Fowey; the monthly proportion is roughly: Fowey, 60,000 tons; all other ports, 8,000. Deliveries direct to destinations by rail seldom exceed 4,000 tons per month. Buyers who may only require a few truck loads, or consumers who are in immediate need of supplies, will frequently take all the way delivery by rail, especially to the Potteries, but compared with sea freights, the rail charges on clay, which range from 26s. 10d. to 28s. 9d. per ton, are prohibitive for large quantities.

How China Clay is Dispatched

By far the largest tonnage of clay is dispatched in bulk, but in its transit from the works to the ports most of it has now to be sheeted in deference to the demands of the paper makers, who have in recent years been very particular about the moisture percentage in the China Clay they buy. This stipulation has produced quite a demand for tarpaulins. The sellers have to bear this extra cost in getting their clays to the ports, but the buyer has to pay if he desires delivery of clay in casks or in bags. The extra charges are, including filling, single cut bags 9s. 6d. per ton; double cut bags, 16s. 6d. per ton; in half-ton casks, 19s. 6d. per ton; in quarter-ton casks, 22s. 6d. per ton. Clay dispatched to far distant ports, such as India and some American ports generally, goes in casks. An ever-increasing quantity is now being sent in casks, and a far greater quantity in bags. The latter mode of dispatch is very convenient to buyers who sell from store to customers in small lots.

Sales through Merchants

The number of producers of China Clay who confine their sales to consumers only can be counted on one hand; the rest sell to middlemen merchants, as well as to consumers, many of these being themselves merchants as well as producers. The large number of small companies with only one or two works find it unremunerative to set up the sales organisations and agencies necessary for the direct-to-consumer business, and therefore sell their outputs to merchants. In this class of business the merchant-buyer charters the vessel, although the seller is responsible for seeing that the cargo is on board within the time prescribed by the brokers who act for the merchant. If the clay is to be shipped in casks or bags the merchant usually supplies them, the seller invoicing the clay at the f.o.b. bulk price.

Another class of seller is the producer who makes deliveries to merchants and consumers. In the case of sales to merchants, the same practice is generally preferred by the buyer, but where there is a variation from this method and in the case of direct-to-consumer business, the seller charters the vessel at c.i.f. for delivery to store (if to replenish stocks from which to draw as customers require) or to customers' destination in the case of customers buying for direct delivery. The price charged to customers in such cases would be the f.o.b. Fowey price, plus charges between Fowey and the destination. Producers doing a direct-to-consumer business have to maintain agencies in various centres both in this and foreign countries.

The American Trade

As regards the American trade, there are comparatively few China Clay producing firms doing direct-to-consumer business; in fact, it may be said to be limited to only three or four. Most of the business is done through middlemen who buy outright and who have their own sales organisations and distributing centres from which consumers are supplied. The merchants, though their purchases run well into six figures annually, maintain, except in rare cases, no buying agencies over here, relying upon the sample post and correspondence, with occasional visits to the China Clay centre for entering into contracts. The arrangements for shipping the clay as required are made through the brokers. There is a special series of large vessels earmarked for the American trade known as the "Clay Line," these frequently taking 7,000 tons apiece. By an arrangement which exists between the China Clay shippers and the ship owners, a certain number of clay firms are permitted to ship on these vessels. It frequently happens that half-a-dozen buyers will be shipping on one vessel; rarely does any one firm charter one of these big vessels. Except through the old-established China Clay merchant firms in America, there is little opportunity nowadays for producers who have not their own connection already established to get into the direct-to-consumer business. For one thing, the established American firms have the States pretty well covered, and for another, the setting up of agencies and stores, and the maintenance of sales organisations at such a great distance would involve an outlay that few firms care to undertake. The majority of producers prefer to sell outright to the merchant at the f.o.b. price Fowey.

The custom in the trade is for payment for consignments within thirty days of shipment. This limit applies to the traders as a whole and is expected to be strictly adhered to and enforced.

The Drying of China Clay

Some Possible Advantages of a New British Process

By the present method of drying china clay anything from five to ten tons of saleable clay are produced per ton of coal burnt, and the average is probably more like seven. The figure varies with the amount of water to be removed and the efficiency of the apparatus. With the present type of drier there is a great amount of surface exposed for radiation to the atmosphere, which means that probably half the heat of the coal is wasted and does not take any part in the drying.

Moisture Content

The moisture contained in the clay taken from the settling pits naturally depends upon how long settling has taken place and if, as sometimes happens, the settling pit has been used for storing wet material for several months, it is quite possible that a water content of 40 per cent. by weight is the result.

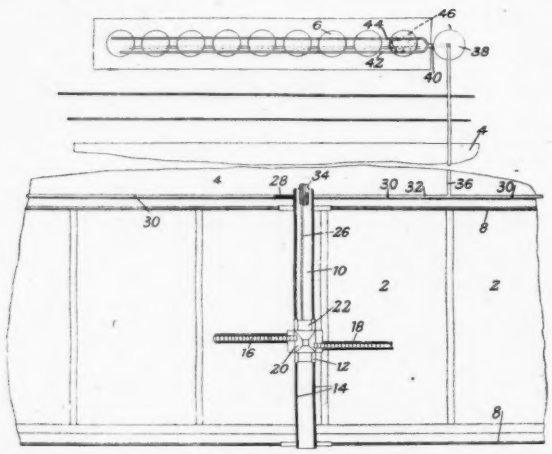


Fig.1

On the other hand, if no prolonged settling takes place, a 50 per cent. water content of the mixture which has to be dried is more likely. This naturally makes a difference in the amount of coal required for drying; and, no doubt, this accounts largely for the discrepancies in the figures claimed by various China Clay manufacturers, where kilns are approximately the same length.

The main line of advance hitherto has been the lengthening of the kilns, the result of which is mainly to cool the gases further before they leave at the chimney. On the other hand, the lengthening of the kiln results in more surface being exposed to radiation, but there is a net gain by the lengthening of the kiln.

Novel Drying Process

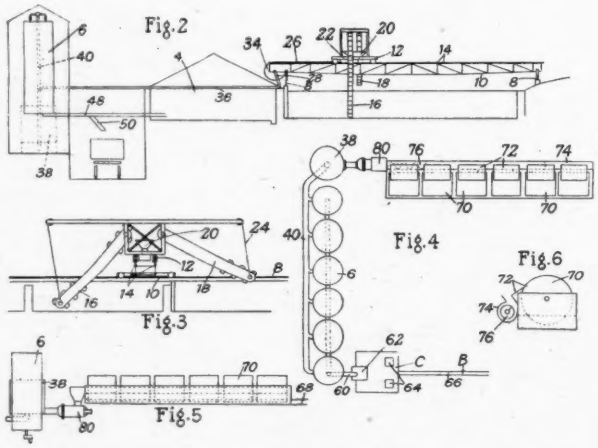
A new process, invented by Mr. Thomas Rigby, of London, is designed for the drying in a novel manner of various materials, including china clay, and with consequent increased economy. Mr. Rigby uses steam as the heating medium through heating surfaces, which are constructed of metal and generally in the form of drums.

It is well known that the greater part of the heat of steam is that of the latent heat quantity, and this is the quantity which is commonly used in carrying out heat transfer through metals. It is a fact well known to steam engineers that heat transmission through a given heating surface, by means of the latent heat of steam, is very much greater than is the case when the heat of gases through heating surfaces is used in a similar manner. It has been estimated by various investigators that the heat transmission, when using steam, is 250 times that when using gases to transmit the heat through similar surfaces with the same temperature differences. When this fact is realised, it will be understood that, when using steam heat, a very small difference of temperature will mean a comparatively large transfer of heat, and this principle is worked on in this invention for steam drying.

Now, if exhaust or live steam is used as the heating medium in the first place in an apparatus as described, the latent heat of steam transmitted through the heating surfaces is utilised in evaporating water from the china clay on the other side of the heating surface, and as the clay is arranged in the form of a thin film on the heating surface, a very quick transfer of heat results, and a corresponding amount of steam is given off from the china clay film. This steam is of approximately the same value as steam which has been condensed on the inlet side of the heating surface, and the steam is taken to a second drying chamber, arranged in a similar manner to that of the first. The same can happen with a third stage, and so on, according to the number of stages which can be arranged. In order to effect this it is necessary that the pressure in the chamber in which the film is being treated should be less than that of the steam on the inside of the drums contained in that particular chamber, so as to give the necessary temperature difference to enable the flow of heat to take place, so that the number of stages which can be arranged in a given apparatus will depend on the over-all temperature difference and corresponding pressure difference between the first and last stages, and, in addition, of course, on the temperature difference required per stage.

Inlet Pressure of Steam

Such an apparatus is better working at a low pressure, and for this reason it is desirable to keep the maximum pressure down. An admirable arrangement is that the inlet pressure of the steam should be approximately an atmosphere pressure above that of the atmosphere (say, 14·7 lb. gauge), whereas the lowest pressure and corresponding temperature will be that which can be obtained by means of the vacuum of a condenser. This, in practice, means that the inlet temperature of the steam in a saturated condition will be 250° Fahr., whereas the lowest temperature of evaporation, being practically that of a condenser, would be about 104° Fahr.; in all, there is a difference of about 146° Fahr. over-all between first and last stages. If this over-all difference is divided by the number of stages required, it gives approximately the temperature difference available for evaporation at each stage. In the case of a six-stage machine it would be 24°, approximately, whereas in an eight-stage machine it would be 18°.



It is known from practice that the quantity of material dried for a unit of surface varies nearly directly as this temperature difference, so that the output from a given heating surface will vary according to the number of stages arranged and the temperature difference. It will thus be seen that, apart from considerations of cost, the greater number of stages used the greater the heat economy, as the heat of the steam is used again and again, until the steam evaporated from the last vessel is wasted in a condenser.

In deciding the number of stages which shall be used for any work, the cost of the apparatus which can be afforded is to be taken into consideration, and, as the cost of the apparatus will vary approximately inversely as to the number of stages, or, directly, as to the temperature difference, it becomes possible to decide what the economy shall be, taking into account the capital costs. With the six-stage machine it is expected that 50 tons of china clay be dried per ton of coal burnt, whereas with a four-stage machine it will be more like 30 tons per ton of coal burnt, the coal being consumed in a small steam boiler to produce the steam for the first stage.

It will be gathered from this description that the only fresh heat coming into the drier is that introduced into the interior of the drums at the first stage, the remainder of the drying being worked by steam driven off from the china clay itself. The only power required is that to rotate the drums, which is very little. They only rotate at one revolution per minute, it being estimated that 5 h.p. would operate a drier for drying 200 tons of china clay per week.

Plant has already been built embodying these designs, and it has been successfully demonstrated that the principles of the invention are sound. Some further work, however, has to be done to put it on a commercial basis, and this is being done by S. H. Johnson & Co., Ltd., engineers, of Stratford (to the designs of Industrial Driers, Ltd.), who are well known as makers of filter presses and de-watering apparatus generally. It is expected that the new apparatus will require little attention and will save some labour, as the material is delivered dried from the machines without man-handling.

The present cost of drying and labour for handling china clay from the settling pits, delivering it through the drier and into railway wagons (including coal cost) is something like 10s. per ton, and it is expected that the half of this will be saved by the new combination, so that such a saving is of considerable importance to the trade if it is carried out in practice. The capital cost of such a machine is also of importance, but it is estimated at present that such a machine, with all its appurtenances, will certainly cost less than a drier of the existing type—apart from any saving in labour which may be effected.

Patent 183535 (see illustrations) shows the drying machine applied to china clay, and, in addition, shows some new combinations which, if carried out, would do without settling-pits altogether. It is not proposed, however, by the company which now owns the patents to apply these at the present stage, but simply to arrange for installations of drying machines to take the place of the existing kilns and to use the existing kilns as China Clay storehouses.

China Clay Royalties

To the Editor of THE CHINA CLAY TRADE REVIEW.

SIR,—*Re* your article on "China Clay Royalties" on page 10 of your number of January 20, 1923, I am greatly interested in this subject, and think that something should be done to interest members of Parliament so as to obtain legislature in favour of the leaseholders. The main points of injustice at present pressing on the leaseholders are the absurdly high royalties, ranging, as your article points out, up to 7s. per ton, the general terms and the iniquitously short tenure of a lease, the fact that at the expiration of that lease the buildings and drys, costing anything from £10,000 to £15,000, become the property of the landlord, possible conditions of renewal of lease, and perhaps 50 per cent. increase in royalties. With these disabilities removed I am sure the trade might become far more prosperous. What steps in your opinion should be taken to bring this matter prominently before Parliament? One has to remember, of course, the powerful vested interests on the other side.—Yours, etc.,

for THE UNITED CHINA CLAY CO., LTD.,
W. E. S. TAYLOR,
January 22, 1923. Managing Director.

[We should like our readers' opinions upon Mr. Taylor's letter. For our part, we think this is a subject which could well be taken up by the "Associated." With its powerful support, very much could be accomplished in the interest of the Trade.—EDITOR, *C.C.T.R.*]

What is Bentonite?

THE remarkable properties of the mineral Bentonite, which appears somewhat to resemble China Clay in many of its properties and uses, has attracted considerable attention. Bentonite consists essentially of aluminium silicate, and the chief deposits are to be found in North America. Beds are to be found in Wyoming, South Dakota, California, Utah, Arizona, Tennessee, Texas, and also at several places in Canada and British Columbia. The deposits in most places lie near the surface, though in California they are mined by underground methods.

Below we give analyses of five selections of Bentonite :—

	I.	II.	III.	IV.	V.
	P.c.	P.c.	P.c.	P.c.	P.c.
Silica, SiO_2	60·18	63·20	59·84	69·52	69·46
Alumina, Al_2O_3	26·58	12·90	11·84	21·64	16·25
Ferric oxide, Fe_2O_3	—	2·46	3·26	3·06	3·35
Lime, CaO	0·23	0·82	2·90	nil	2·06
Magnesia, MgO	1·01	2·09	2·32	0·21	2·76
Alkalies	1·23	0·92	4·47	nil	1·08
Loss on ignition	10·26	13·80	10·50	5·45	5·04

I. Type material, near Rock Creek, Laramie Basin, Wyoming, U.S.A.

II. From Big Horn Basin, Wyoming, U.S.A.

III. From Ota, San Diego County, California, U.S.A.

IV. Colloidal material washed from Bentonite, taken from between coal seams Nos. 6 and 7, near Gibson mine, Drumheller, Alberta, Canada.

V. From the main parting in No. 1 coal seam, Rosedale mine, Alberta, Canada.

After mining, the Bentonite obtained in South Dakota by drilling and blasting, is weathered in stockpiles in the open, and then dried in thin layers on steam coils. It is then crushed in the mills, screened, and taken to the disintegrators. This particular brand finds a market as a water softener. Bentonite is in appearance much like other "soapy" clays, and becomes very plastic when wet. It is exceedingly fine grained, and with an excess of water remains indefinitely in suspension. Bentonite, like China Clay, is used as a filler for paper and soap, and also as a sizing for the textile industry.

Among the many other suggested uses to which Bentonite could be put are: the cleansing of cloth; the clarification of oils; as a filler for rubber, gramophone records, textiles, cordage, and pressed and moulded electrical insulation; in the manufacture of paint; replacing bonding clay in the manufacture of electrical and chemical porcelain, abrasive wheels and graphite crucibles; as a base for precipitating lake colours; as a base for massage cream and printers' ink; mixed with oil as a heavy lubricant; as a dressing for leather and as an absorbent in dynamite manufacture. It is therefore apparent that this substance seems likely to become of considerable commercial importance, and deposits of clay throughout the Empire should be examined in order to find out if they are of this variety. It is quite simple for any amateur prospector to test a suspected sample by dropping it into a cup of water, when, if it is Bentonite, it will swell and rapidly assume the consistency of soft soap, afterwards going completely into suspension. A confirmatory test could be applied by holding a thin splinter in a blowpipe flame, when Bentonite would readily fuse at the edges, whilst ordinary clay would not. Any promising samples which might be discovered should be forwarded to the Imperial Institute for investigation. Specimens of Bentonite can be inspected at the Imperial Institute.

A New China Clay Company

THE North Goonbarrow China Clay Co., Ltd., was registered, on January 22, as a private company with a capital of £10,000 in £1 shares, to acquire the business of the North Goonbarrow China Clay Co., and to search for, quarry, refine, prepare for market and deal in China Clay, china stone, ball clay, felspar, potters', paper makers' and cotton spinners' materials and chemicals, etc. The first directors are: H. Nicholls (managing director), Gwarder, St. Austell; W. W. R. Nicholls, Penair House, St. Austell; A. C. Best, Tregarthen, Wolstanton; W. T. Nicholls, Hallaze, St. Austell; and A. Ede, 3, Slades Villas, Slades, St. Austell. The qualification for directorship is £500, and remuneration will be fixed by the company. The registered office of the company is at 3, Victoria Place, St. Austell, and the file number is 187,269.

China Clay Notes and News

A Lucky China Clay Owner

The Times for January 31st has the following advertisement, under the heading of "Directors and Partners":—

CHINA CLAY.—OWNER good Property, going concern, requires PARTNER with £6,000. Profits over 50 per cent.

We envy the fortunate owner!

China Clay Business Purchased

Messrs. Winser and Co., of Deansgate, Manchester, announce the sale of their china clay, barytes, whiting and french chalk business to Messrs. Tennants (Lancashire), Ltd., 1 Booth Street, Manchester, a chemical firm established over 100 years ago. This firm has also arranged to continue the sales agency of the Gotham Co., Ltd., Nottingham and Carlisle, for mineral white, plaster of Paris, and all gypsum products.

China Clay in Fiction

Mr. Henry Hancock, of Slades, St. Austell, who has long had a reputation as a writer of humorous and dramatic sketches in the Cornish dialect, has contributed to *Doidge's Annual* an interesting short story, entitled "Johnny Hunchback," which should appeal to our readers, because the scene is laid in the St. Austell district, and all the characters are associated in one way or another with the China Clay works.

China Clay Cargo Stranded

From an intimation of a Lloyd's message from La Rochelle, a vessel the *Rose Mysterieuse*, laden with a consignment of china clay to the order of Messrs. J. Lovering and Co., at St. Austell, and bound from Charlestown to Rochefort, stranded on the Chanchardon rocks, Ile de Re, on the night of January 7. The master, on arrival at La Rochelle, stated that the vessel was a complete wreck, and there was not the slightest prospect of salving the cargo.

What Publicity Does

As evidence of the effect the dissemination of judicious information as to the uses of certain China Clays has upon the industry as a whole, our recent article on Mica China Clay is a case in point. Since that article appeared, producers have been inundated with inquiries from home and foreign countries, especially the Continent, leading to substantial business. As a matter of fact, business in these common China Clays has been more brisk during the last two or three months than for a very long time past. As the patent food advertisements say: "There's a reason for it."

A Remarkable Mill

A mill which can grind materials so finely that they enter into the colloidal state, and so remain in suspension for an indefinitely long period, has been invented by Dr. Plauson and is now obtainable in commercial sizes. This "colloid mill" resembles the ordinary disintegrator used for very wet materials, but is driven at a much higher speed (3,000-4,000 revs. per min.). The material to be ground is mixed with eight or nine times its weight of water, and is then passed through the mill, which reduces the solid particles to less than $\frac{1}{30000}$ in. in diameter, and as their surface tension is greater than the effect of gravity, they remain in suspension until precipitated by some chemical or other agent. This machine is capable of many uses, and by its means clays of exceptional fineness can readily be prepared. The ground materials can only be separated from the water or other fluid in which they are suspended by passing the mixture through a special filter. Considerable information in reference to this mill has already been published in THE CHEMICAL AGE.

"Review" in New Style Welcomed

Those who had come to appreciate the value of THE CHINA CLAY TRADE REVIEW as the trade organ of the industry, have expressed themselves agreeably surprised with its development and appearance in a new garb. It is recognised that its issue in conjunction with THE CHEMICAL AGE is a splendid step in advance, not only because of the opportunity afforded for disseminating information about China Clay over the wide area embraced by the chemical industry, but because it presents to advertisers a much larger and more profitable field for the exploitation of other raw material. Rightly used by those interested in the industry, whether in its news or advertisement columns, THE CHINA CLAY TRADE REVIEW, in its new form is considered by the more progressive among the China Clay producers to offer an unusual opportunity for revealing to a greater extent than ever the manifold uses to which China Clay may be put by the chemical world. Some of the uses named and suggested from time to time in the REVIEW have already opened the eyes of many manufacturers previously ignorant of its qualities. The proprietors much appreciate the reception given to their enterprise and rely upon the co-operation of the China Clay producers and their allies to assist them in making the journal fulfil its mission—the mutual benefit of sellers and users of China Clay.

Mr. Sigmund Goldman

We are glad to learn that Mr. Sigmund Goldman, president of the English China Clays Sales Corporation, of 33, West Forty-second Street, New York, is making progress after his

MR. S. GOLDMAN

severe illness. Mr. Goldman is well known to many friends on both sides of the Atlantic, who will join in wishing him "good luck" and many more years of active business life.

A New Refractory

Mr. Walter Smith, in the *Journal of the West of Scotland Iron and Steel Institute*, points out the marked difference which exists between admixtures of carbon and clay, and the structural change in clay itself after undergoing treatment by carbon-charged gases, according to the process. The contractive force of clays, which is enormous, is a well-known phenomenon, which has been a source of much trouble to workers, on account of the fracture which is liable to result. The first laws controlling the carbonisation of clay are those relating to density as a result of compression, and their operation is vividly described. The governing principles in the carbonisation of clay are heat and time, a correct determination of the quantity and duration of which is essential to obtain efficiency. A general view of the *modus operandi*, and its effects upon a clay suitable for the purpose, is given. There are many economies attached to the process, and one of the greatest troubles in connection with refractory materials, viz., contraction by subsequent firings, is overcome.

Carbonised clay falls into two groups, *i.e.*, black and white, the former providing a material adapted for heat resistance in reducing atmospheres, whilst the latter should be used in furnaces where air is freely admitted. As a heat conductor, the clay should be used in the black condition; as a non-conductor, in the white. Carbonised clay is recommended for filter beds and the production of high-class acid-resisting ware, whilst its hardness is just short of carborundum. The carbonised brick conducts with twice the efficiency of the standard firebrick. Attention is specially drawn to the possibility of economically liberating iron oxide from the limitless red clay and shale beds, and a new industry is therefore to be considered. Alkalis may be liberated from clay, and a solution of the problem of its purification on a commercial scale is thus rendered feasible.

The Month at St. Austell

(From Our Own Correspondents.)

Mr. A. Henry Pochin

After an association extending upwards of 28 years with the board of H. D. Pochin and Co., Ltd., of Manchester and St Austell, Mr. A. Henry Pochin, son of the late Mr. Wm. Pochin, has retired. He was presented with a handsome Sheraton timepiece by the members of the staff as a token of their appreciation of goodwill. Mr. Pochin has local interests at Southport, to which he intends devoting the whole of his time.

Death of Mr. J. T. Hawke

The death of Mr. John T. Hawke, J.P., which occurred at Fairfield, St. Austell, on January 30, following an attack of pneumonia, has created a void in the life of the China Clay town of St. Austell that will be hard to fill. About 23 years ago Mr. Hawke succeeded to the firm of Messrs. George Hawke and Son, iron and hardware merchants, upon the death of his father. Though not directly interested in the China Clay industry the firm that has been familiar to the readers of the advertisements in The China Clay Trade Review has supplied materials for the clay works in the neighbourhood for over 50 years. The interment took place on February 3, the Rev. A. H. Fowler, of Newbury and J. H. N. Whitfield, M.A., officiating.

St. Austell Unemployed

Commenting upon the fresh proposals for expenditure on unemployment relief works, Mr. J. Hoyle (who is a China Clay producer connected with the Manchester China Clay Co., and a director of the Associated China Clays, Ltd.), at the St. Austell Rural Council meeting, confessed himself alarmed at the way in which the Council were piling up expenditure, and commented that their commitments were getting appalling.

There was, he admitted, a lot of agitation about unemployment in the country, and no doubt the Government would have to do more, and the longer they, as a Council, waited, the better terms they would get. They had always been in too much of a hurry to get on with schemes by a certain date, because they were told the terms would otherwise be withdrawn. He pointed to the effect the rates were having on the clay trade, which wanted to get the price of clay down because, with a cheaper article, there would be a bigger demand. The rates were at present very high, and in the case of works where the dues were heavy the rates played an important part in the price of clay. Last year's trade was the largest since 1914, but they were working nothing like their full capacity. They could not hope to employ all the men in the district in the clay trade, and yet that was the trade the Council were looking to to employ these men eventually.

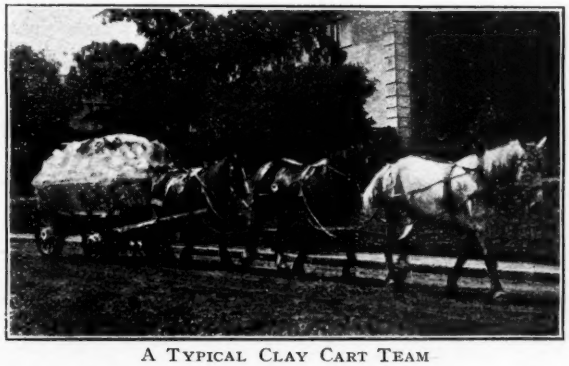
Death of Mr. John Stephens

The death of Mr. John Stephens, which took place at his residence, Sydenham, on January 17, has deprived the whole China Clay district of St. Austell not merely of an interesting personality, but of a gentleman who occupied a high position in the municipal and political life of the town. Towards the end of the year 1920 he retired from the position of clerk and legal adviser to the St. Austell Board of Guardians and Rural District Council after a period of 25 years' service. Mr. Stephens was also Superintendent Registrar and Registrar of the St. Austell County Court. For many years he took a keen interest in the political welfare of the Mid-Cornwall Unionist Association, of which he was chairman, and was regarded as the best advocate of Unionist principles in the county. He won distinction as a partner in the firm of solicitors, Messrs. Carlyon and Stephens, where his exceptional qualities as a speaker placed him in the front rank of local advocates practising in the Courts.

Although not directly associated with the China Clay industry, Mr. Stephens took a great interest in its development, and no doubt, if the war had not intervened, would have soon developed some deposits in his own lands in the northern area of the county. A sister of the late Mr. John Stephens is the wife of Mr. John Lovering, J.P., senior partner of the firm of Messrs. John Lovering and Co., China Clay merchants, of St. Austell. The funeral, which took place at St. Ewe on the following Saturday morning, was attended by representatives of the St. Austell Board of Guardians, Rural and Urban District Councils, and the Unionist agent represented Captain Denis Shipwright, who was absent through indisposition. The mourners were Mr. John Lovering (brother-in-law), Mr. J. S. Lovering and Mr. Cecil D. Lovering (nephews). Amongst those present were Mr. J. Perry, Col. W. T. Lovering, Mr. F. Lovering, Mr. J. W. Higman, Mr. F. Parkyn, Mr. Hart Nicholls, representing the China Clay industry.

A Street Accident and its Moral

The district of St. Austell has rarely experienced such an alarming street accident as it did on the morning of January 11. Since the diversion of much of the China Clay traffic by the new branch railway to Bojea and Carthew the quantities carried by road wagons through the streets of St. Austell have been considerably reduced. On the morning in question a heavily laden wagon and three horses (similar to our illustration and within a few yards of the spot where this photograph was taken) was conveying China Clay from the Ruddle China Clay Works to Charlestown Docks.



A Typical Clay Cart Team

When descending the Watering Hill, the young carrier, Thomas Hancock, was tightening the brake when the main bolt came out. The shaft horse tried to retard the progress of the wagon until the harness broke; then it was left to the mercy of a galloping chance. In its rush down several vehicles managed to get into a side road out of the way, but a grocer who was also going down the hill leading his horse and cart was not so fortunate. His cart wheel was not only struck, but he was thrown against the wall with his horse upon him and was rendered unconscious. The wagon just a little further on struck the side of the pavement and was overturned. Two of the clay carrier's horses were injured rather badly.

With the increase of motor traffic the streets of St. Austell are not wide enough for the heavy clay traffic, and the problem ought not to be such a difficult one for solution. The Great Western Railway could easily extend their Trenance Siding up the Gover Valley for all clay in that district, which would prove a great boon to the firms and an immense saving of road traffic. The Great Western Railway Company have such a pull on the industry that they might well afford to give some consideration for a branch line to the docks at Charlestown.

A Mine Shaft Fatality

A fatal accident occurred recently at the Burthy China Clay Works, St. Enoder. It appears that two men who were engaged in the pumping shaft noticed some splintered wood in the timber work forming the sides of the shaft. The foreman shaftsman, Thomas Champion, to whom they reported the defect, went down the shaft to investigate. While he was there the timber collapsed, carrying with it a quantity of débris and the ladder with Champion on it to the bottom, a depth of 25 ft. He sustained serious injuries as the result of the fall and he was removed to the St. Austell Cottage Hospital, where he succumbed on February 2. The deceased, who was 66 years of age, leaves a widow. An inquiry was held at the Cottage Hospital on February 3, when a verdict of "accidental death" was returned. Both Mr. J. Perry, J.P., the managing director of the Burthy China Clay Co., and the coroner expressed their sympathy with the widow and relatives.

Industrial and Trade Reports

(From our Own Correspondents and Other Sources)

Great Britain

The Home Paper and Pottery Industries

The British paper trade is reported as good. December last saw the high-water mark attained in the export of newsprint, when 4,511 tons were sent overseas. Coated art papers are steadily improving their position in the market.

In the pottery industry prices are stabilised for a whole year, which should give buyers confidence. There are still many unemployed in the pottery districts, but there are signs of a trade revival in the near future. The year 1922 was not a good one, but manufacturers and travellers are full of hope for 1923.

China Clay Prices

China Clay in bulk f.o.b. Cornwall is 28s. 9d. to 72s. per ton. The extra charges are: Single bags, 9s. 6d. per ton; double bags, 16s. 6d. per ton; half-ton casks, 19s. 6d. per ton; quarter-ton casks, 22s. 6d. per ton; casks, with extra iron hoops, 2s. per ton more.

North and Midlands

Although the forecasted improvement has not yet made itself appreciably felt, it cannot be denied that returns in the big industries are on the up-grade.

So far as the cotton trade is concerned the published statement of the Master Cotton Spinners' Association that for the week ending January 20 the sales returns were 6,000,000 lb. in excess of the actual production, would make it appear beyond doubt that there is a growing demand for yarn.

The complaint from the weavers is that although orders and inquiries are being passed about freely, the prices mentioned show little or no profit to the manufacturer, a state of affairs that they are hoping will be remedied by the gradual hardening in the price of raw cotton. The improvement of the diplomatic relationship between this country and Turkey is a cause for gratification in Lancashire, as although it may not be generally known Turkey is the third best customer for Lancashire cotton goods—India and China only coming before her.

From inquiries in the Pottery district of North Staffordshire amongst trade and railway officials, travellers, and manufacturers, we find that opinion is not by any means unanimous. A few factories are still doing very little or nothing, but a far larger proportion are keeping quite busy. January railway returns for Longton show a moderate improvement, and after looking at things from an all-round standpoint, we think it safe to say that the pottery trade as a whole is regaining confidence. Both coal and iron markets are very firm, with prices in the latter trade steadily rising and creating a good tone all round. The sensational reports of huge orders for coal and iron coming to this country in consequence of the Ruhr occupation must be taken for the most part as gross exaggerations, and possibly have their origin from sources where there is an axe to grind.

United States of America

Continued Shortage of Casein

The president of one of the large paper companies has stated recently that the lower the price of coating clay the more coated paper was used. In other words, when the price of coating clay goes down the lowered cost of producing coated paper induces more extensive use of such paper. Naturally enough, when the manufacture of coated paper increases, the market for coating clays becomes more active.

The continued shortage of casein is proving a very serious obstacle in the manufacture of coated paper. The so-called modified process wherein substitutes for casein are used is not proving very satisfactory. However, the New England mills are quite busy taking care of unfilled orders, although there is a falling off of new orders.

The situation with the American potteries has been much easier, although an unauthorised strike, involving about 500 men, has been reported. On the whole, the pottery outlook is bright and a satisfactory volume of English potting clays should be required during the succeeding weeks.

U.S.A. China Clay

The past two weeks in the clay market have been marked by a much better feeling in all grades of clays than was the case during any part of December, and it was reported that prices will probably grow stronger in that market soon because of the much strengthened demand. Meanwhile, prices are firm and each day seems to mark an increase in the demand, which has made for considerable optimism in that market. Available quotations are given below:—

English clay, ex steamer, per ton..	140·0 to 20·00
Domestic clay, washed, per ton ..	80·0 to 10·00
Domestic clay, unwashed :	
No. 1, per ton	6·00 to 7·00
No. 2	5·00 to 6·00

Canada

Saskatchewan's Clay Deposits

The Province of Saskatchewan has a number of clay deposits that give promise of having considerable value, and reports from various sources about the existence of these deposits resulted in the Provincial Bureau of Labour and Industries securing the services of a ceramic engineer for the purpose of investigating and assisting in the development of these resources.

The reports of the engineer to date cover two districts in the Province known locally as the Readlyn-Willows district and the Eastend-Ravenscrag district, and show that the deposits are of great extent, and many are high quality clay. In the former district the clays were found to be of the ball or semi-ball types, burning nearly white; in some cases a creamy white, burning much lighter than similar commercial clays of Great Britain and the United States. This field is close to transportation, and is a relatively short distance from the Souris coal fields, which makes it a most attractive point for development. The clays should therefore form the basis for the manufacture of such lines as granite ware, floor and wall tile, insulators and similar wares where a white body is desired. There are also to be found in this district clays of the stoneware type, as well as semi-refractories suitable for sewer pipes, terra cotta, enamel ware and fire-brick linings.

India

Import Duty on China Clay

The revised schedule of tariff valuations fixed by the Governor-General in Council for the purpose of levying Customs duties in British India imposes an import duty on China Clay of 15 per cent. on the revised tariff valuation of 90 rupees per ton. The new rate of duty became effective on January 1.

Finland

Chemical Pulp Exports

All the exporting industries of Finland have attained record figures for the post-war period, while some of them have even surpassed the best figures of the days of peace. This is the case in an eminently high degree with the chemical pulp industry, for example, the exports of which for the year are nearly two and a half times as great as they were in 1913, owing, of course, to the swift progress made by this industry during and since the war. The paper industry, too, can point to a result which surpasses that of 1913 by nearly 64,000 tons, although the enlargements and new machinery instalments which have taken place here are by no means so extensive as those in the chemical pulp industry. In the case of mechanical pulp, the year's result may be described as about normal. Cardboard, which was exceedingly weak during 1921, now shows greatly improved figures, though it still has not come up to the remarkable figures achieved in the days before the war. In a country like Finland, which has to work its way into comparatively new markets, and in which, owing to our proximity to Russia, labour peace is more essential than it is in most other countries, it has naturally been an inestimable advantage to have been able to increase the quantities exported and keep all the mills running. But nevertheless, the economic gain has been restricted by the fact that we have been living through a general world depression, and that prices have been screwed down to a level which in many countries made production simply impossible. Although many of the Finnish exporters may say that they are on the whole satisfied with the year, they have no reason to boast of it as an especially rosy one.

Shipping and Export News of the Month

We give below the latest particulars relating to arrivals and sailings of ships engaged in the China Clay Trade, at the principal British clay ports. Registered exports of China Clay with countries of destination, and other shipping and export matters are dealt with.

Fowey Shipping—January 1923

Arrived.		Vessel's Name.	Sailed.	
Jan. 1,	S.S.	*Jarrix*	Jan. 5,	Ridham
Jan. 1,	S.S.	*Mersey*	Jan. 5,	Preston
Jan. 1,	S.V.	*Minerva*	Jan. 15,	Nantes
Jan. 1,	S.S.	*Polly*	Jan. 8,	Savona & Genoa
Jan. 1,	S.S.	*Farfield*	Jan. 4,	Liverpool & Garston
Jan. 1,	S.S.	*Brier Rose*	Jan. 5,	Larne
Jan. 1,	S.V.	*Rhoda Mary*	Jan. 15,	Runcorn
Jan. 2,	S.S.	*Hans Maersk*	Jan. 5,	Philadelphia, U.S.A.
Jan. 3,	M.V.	*Belleville*	Jan. 11,	Skein
Jan. 3,	S.S.	*Admiral*	Jan. 6,	Weston Point
Jan. 3,	S.S.	*Gorilla*	Jan. 5,	Liverpool
Jan. 3,	S.S.	*Eibergen*	Jan. 13,	Philadelphia, U.S.A.
Jan. 4,	S.S.	*Pansy*	Jan. 8,	Preston
Jan. 5,	S.S.	*Othem*	Jan. 11,	Norrkoping
Jan. 5,	S.S.	*Leeds City*	Jan. 23,	Philadelphia
Jan. 5,	S.S.	*Beeston*	Jan. 9,	Ridham
Jan. 5,	S.S.	*Joffre Rose*	Jan. 11,	Preston
Jan. 5,	S.V.	*Rossing*	Jan. 17,	Rochefort
Jan. 8,	S.S.	*Nicholas*	Jan. 11,	Rouen
Jan. 8,	S.S.	*Devon Coast*	Jan. 10,	Liverpool
Jan. 8,	S.S.	*Sweden Maru*	Jan. 27,	Philadelphia, U.S.A.
Jan. 8,	S.V.	*J. H. Barrow*	Jan. 27,	Par
Jan. 8,	S.S.	*Abington*	Jan. 12,	Rochester
Jan. 9,	S.S.	*Camm*	Jan. 13,	Gravesend
Jan. 11,	S.S.	*Fullerton*	Jan. 30,	Portland, Me.
Jan. 12,	M.V.	*Albert Mou*	Jan. 17,	Odense
Jan. 13,	M.V.	*Lydia Cardell*	Jan. 30,	Antwerp
Jan. 13,	M.V.	*Romanie*	Jan. 18,	Brussels
Jan. 13,	M.V.	*Alroy*	Jan. 20,	Rouen
Jan. 13,	M.V.	*Ashalad*	Jan. 19,	Bo'ness
Jan. 13,	S.S.	*Edith*	Jan. 18,	Sarpsborg
Jan. 14,	S.S.	*Blush Rose*	Jan. 19,	Weston Point
Jan. 14,	S.S.	*Lord Antrim*	Feb. 2,	Portland, Me.
Jan. 15,	S.V.	*Saint Mathieu*	Jan. 30,	Barcelona
Jan. 15,	S.S.	*Florentino*	Jan. 25,	Genoa
Jan. 15,	S.S.	*Luffworth*	Jan. 15,	Par
Jan. 15,	S.S.	*Guelder Rose*	Jan. 20,	Runcorn
Jan. 16,	S.S.	*B.W. III*	Jan. 22,	Ghent
Jan. 16,	S.S.	*Brier Rose*	Jan. 22,	Preston
Jan. 16,	S.S.	*Falmouth Castle*	Jan. 23,	Runcorn
Jan. 16,	S.S.	*Glenrose*	Jan. 19,	Par
Jan. 17,	S.S.	*Mersey*	Jan. 25,	Rouen
Jan. 17,	M.V.	*Isabel*	Jan. 22,	Pentewan
Jan. 18,	S.S.	*Gorilla*	Jan. 23,	Birkenhead
Jan. 18,	S.V.	*Hertha*	Feb. 6,	Tayport
Jan. 18,	S.S.	*Primrose*	Jan. 25,	Preston
Jan. 18,	S.S.	*Falconer*	Jan. 26,	Aberdeen
Jan. 19,	S.S.	*Allerwash*	Jan. 27,	Brussels
Jan. 19,	S.S.	*Vechtstroom*	Jan. 27,	Amsterdam
Jan. 19,	S.S.	*Nicholas*	Jan. 26,	Rouen
Jan. 19,	S.S.	*River Fisher*	Jan. 29,	Leith
Jan. 19,	S.V.	*St. Michael*	Feb. 9,	Boulogne
Jan. 20,	S.S.	*Rytoner*	Jan. 29,	Ridham
Jan. 20,	S.V.	*Helena Anna*	—	
Jan. 20,	S.V.	*Emily Warbrick*	Jan. 30,	Par
Jan. 21,	S.S.	*Sikla*	Feb. 2,	Skien
Jan. 21,	S.V.	*Elsa*	—	
Jan. 22,	S.S.	*Mellanear*	Jan. 31,	Antwerp
Jan. 22,	S.S.	*Ualan*	Jan. 23,	Plymouth
Jan. 22,	S.S.	*Waterway*	Feb. 1,	Brussels
Jan. 24,	M.V.	*Lloyd*	Feb. 2,	Gothenborg
Jan. 24,	S.V.	*Leif*	—	
Jan. 25,	S.S.	*Poulteney*	Jan. 28,	Par
Jan. 25,	S.S.	*Holmwood*	Jan. 29,	Par
Jan. 25,	M.V.	*Olive May*	Jan. 28,	Par
Jan. 25,	S.S.	*Marnix*	Feb. 2,	Antwerp
Jan. 25,	S.V.	*Flying Foam*	Jan. 27,	Par
Jan. 25,	S.S.	*Ernrix*	Feb. 3,	Antwerp
Jan. 26,	M.V.	*Floretta*	Jan. 30,	Par
Jan. 28,	S.S.	*Pansy*	Feb. 2,	Runcorn
Jan. 28,	S.S.	*Harald*	Feb. 8,	Bilbao & Pasages
Jan. 28,	S.S.	*Washington Maru*	—	
Jan. 28,	S.V.	*R. Passmore*	—	
Jan. 28,	M.V.	*Isabel*	Jan. 30,	Plymouth
Jan. 28,	S.V.	*Frances and Jane*	—	
Jan. 29,	S.V.	*James Postlethwaite*	Jan. 31,	Par
Jan. 30,	S.S.	*Overton*	Feb. 3,	Ridham
Jan. 30,	S.S.	*Aegir*	Feb. 2,	Gravesend
Jan. 30,	S.S.	*Sutton*	Feb. 7,	Rochester
Jan. 30,	S.S.	*Falmouth Castle*	Feb. 3,	Runcorn
Jan. 31,	S.S.	*Katherine*	Feb. 2,	Plymouth
Jan. 31,	S.S.	*Whinhill*	Feb. 1,	Liverpool
Jan. 31,	S.S.	*Merwestroom*	—	

Par Harbour Shipping—January 1923

Arrivals

Date.		Vessel's Name.	From.
January 4	S.S.	*Holmwood*	Hayle
January 4	M.V.	*Isabel*	Plymouth
January 4		*Matilda*	Plymouth
January 4	S.T.	*Countess*	Fowey
January 4	S.T.	*Gallant*	Fowey
January 6	S.S.	*Ebbrix*	Teignmouth
January 13		*J.N.R.*	Plymouth
January 14		*Yealm*	Port Housestock
January 15	S.S.	*Luffworth*	London
January 16		*Regina*	Mevagissey
January 17	S.S.	*Tanny*	Penzance
January 17		*Kate*	Port Housestock
January 17	S.S.	*Moss Rose*	Penzance
January 17		*Annie Jones*	Falmouth
January 18	M.V.	*Sarah Colebrooke*	Chichester
January 18	S.T.	*Gallant*	Fowey
January 19	S.S.	*Glenrose*	Fowey
January 20		*Pet*	London
January 22		*J.N.R.*	Plymouth
January 24		*Snowflake*	Runcorn
January 25		*Weaser*	Falmouth
January 25		*J. H. Barrow*	Fowey
January 26	M.V.	*Olive May*	Falmouth
January 27		*Flying Foam*	Looe
January 29	S.S.	*Holmwood*	Fowey
January 29	S.S.	*Poulteney*	Fowey
January 30	M.V.	*Florette*	Port Housestock
January 30		*Emily Warbrick*	Runcorn
January 31		*James Postlethwaite*	—

Sailings

Date.		Vessel's Name.	Destination.
January 3	S.S.	*Holmwood*	Western Point
January 4	S.T.	*Countess*	Fowey
January 4	S.T.	*Gallant*	Fowey
January 4		*Daisy*	London
January 4		*Buttercup*	Penarth
January 8	S.S.	*Ebbrix*	Penzance
January 11	M.V.	*Isabel*	Pentewan
January 11		*Matilda*	Pentewan
January 13		*J.N.R.*	Plymouth
January 15		*Yealm*	Pentewan
January 16	S.S.	*Luffworth*	Plymouth
January 17	S.S.	*Tanny*	Bristol
January 17		*Kate*	Plymouth
January 18		*The Sirdar*	Plymouth
January 18	S.T.	*Gallant*	Fowey
January 20	S.S.	*Moss Rose*	Runcorn
January 21	S.S.	*Glenrose*	Dunkirque
January 23		*Annie Jones*	Rochester
January 25		*J.N.R.*	Pentewan
January 26	M.V.	*Sarah Colebrooke*	Queenborough
January 31		*Snowflake*	—
January 31		*Regina*	—

Charlestown Sailings

Date.	Vessel's Name.	Destination.
January 2	S.S. *Christiana*	Manchester
January 3	S.S. *Eider*	Barrow
January 5	*Alice Williams* (schooner)	London
January 6	S.S. *Cross Bill*	Rochester
January 9	S.S. *T. W. Stewart*	Gravesend
January 11	S.S. *Millocrat*	Manchester
January 12	M.V. *Phœnix*	Pentewan
January 12	M.V. *P.H.E.*	Pentewan
January 15	*Duchess* (schooner)	Antwerp
January 18	*Adelaide* (schooner)	Preston
January 18	S.S. *Ellinda*	Granville
January 21	S.S. *Westdale*	Rochester
January 30	*Henrietta*	St. Malo

Registered Exports of China Clay

PARTICULARS are given below of the registered exports of China Clay, including Cornish or china Stone, the produce of the United Kingdom, from the United Kingdom to each country of destination, during the month of January, 1923 :—

	Quantity. Tons.	Value. £
Sweden	339	996
Germany	1,414	3,949
Netherlands	2,523	6,827
Belgium	3,578	7,479
France	1,859	3,697
Spain	164	576
Italy	3,624	8,391
China	2	8
Japan	57	400
United States of America	14,097	33,250
Mexico	215	1,010
Brazil	2	14
Uruguay	50	194
Bombay, via other ports	1,310	5,280
Madras	50	199
Bengal, Assam, Bihar and Orissa	175	740
Australia, Victoria	33	263
New South Wales	23	223
Queensland	1	3
New Zealand	1	6
Canada	124	310
British West India Islands	1	4
	29,642	73,819

January China Clay Exports

FROM the "Accounts Relating to Trade and Navigation of the United Kingdom" (Overseas only) :—

	Quantities. Month ended January 31.			Value. Month ended January 31.		
	1921.	1922.	1923.	1921.	1922.	1923.
CLAY.	Tons	Tons	Tons	£	£	£
China Clay (including Cornish or China Stone)..	7,490	32,198	29,642	32,377	86,234	73,819
Fireclay .	1,325	922	2,720	5,845	2,376	6,375
All other Sorts ..	7,845	3,648	6,764	22,056	10,645	19,097

Fowey Shipping in January

CHEERING news comes from Fowey concerning the shipments at that importanrt port of the month of January. The month of January has invariably been a period of business tranquillity in the clay trade, and its exceptional activities throughout the whole of the month is certainly a good sign for the new year.

January China Clay Deliveries

Increase in Railway Traffic

AFTER a record year, 1923 has opened well for the China Clay industry, the total deliveries for January having exceeded 74,000, being within a couple of thousand tons of the record month of October last. The point of significance in the returns for January is the quantity of China Clay sent by rail throughout to its destination. It is unusual for such a large quantity as 5,000 tons to be dispatched in this way in a single month, and seems to point to a sudden demand in the home markets that would not brook the delay of delivery by sea.

TOTAL DELIVERIES OF CHINA CLAY, JANUARY, 1923.

Port.	Tonnage.
Fowey	63,466
Charlestown	2,695
Par Harbour	1,996
Plymouth	1,031
Falmouth	20

Total sea-borne...	69,208	tons,	against	41,373	in	Jan. 1922.
Deliveries throughout by rail.....	5,076	,,	,,	3,068	,,	,,
Total deliveries to all parts	74,284	,,	,,	44,441	,,	,,

Smart Loading at Charlestown

IN order to catch the tides it is sometimes necessary for exceptional efforts to be made to load vessels at Charlestown. An example of what can be done in an emergency was given on February 3, when the s.s. *Halton* arrived about 5 p.m. for a cargo of China Clay from Messrs. J. Lovering and Co.'s cellars. Loading was commenced at seven the same evening and continued till midnight, by which time 200 tons had been put aboard. Loading was resumed at midnight on Sunday, and by 5 o'clock Monday morning the s.s. *Halton* had received her full complement of 470 tons and left for sea an hour later, bound for a coastal port. She was succeeded in turn by four other steamers which, loaded night and day, had their cargoes completed by Tuesday night. The five vessels took aboard some 2,000 tons in the period from Saturday night to Tuesday night, omitting Sunday, a feat all the more noteworthy because at Charlestown there is no mechanical loading, it having to be done by manual labour.

Some Antwerp Clay Imports in January

FROM CHARLESTOWN : Sailing vessel *John Sims*, 193 tons.
FROM GOOLE : Sailing vessel *Dunkerque*, 140 tons.
FROM TEIGNMOUTH : Sailing vessel *Mathilda Upton*, 162 tons.
FROM TEIGNMOUTH : Sailing vessel *Irish Minstrel*, 253 tons.
FROM FREMINGTON : Steamer *Farfield*, 481 tons.
FROM PLYMOUTH : Sailing vessel *Martinet*, 200 tons.
FROM FOWEY : Steamer *Mellanear*, 486 tons.
IN BRUSSELS FROM FOWEY : Motor ship *Romanie*, 335 tons.
FROM FOWEY : Steamer *Allerwash*, 500 tons.
FROM FOWEY : Steamer *Wearsider*, 360 tons.

German Stones and Earths

DURING the month of December business in the stones and earths industry was in general very slack, few new orders being received. Prices continued to rise. Complaint was continually made regarding inadequate coal deliveries and high freights. In the glass industry the inadequate delivery of raw materials, particularly of Glauber's salt and clay, was complained of. Wages increased 70 to 80 per cent. For those works which are unfavourably situated in respect of coal mines the coal supply is becoming increasingly difficult as a result of rising freights, which affects their ability to compete with better situated works. The inland and foreign trade declined. The chief countries to which sheet glass was exported were Roumania, South West Africa, South America and Italy.

The China Clay Trade Review

The Official Organ of the China Clay Industry and the only Journal specially devoted to its interests. Published in the third issue of "The Chemical Age" each month.

All Editorial communications should be addressed to the Editor, "The China Clay Trade Review," Benn Brothers, Ltd., 8, Bouverie Street, London, E.C.4. All communications relating to Advertisements, Subscriptions, and other business should be sent to the Manager, "The China Clay Trade Review," at the same address. Telegrams—"Allangas, Fleet, London." Telephone—City 9852 (6 lines).

Contents

Colloidal China Clay

THE information published in our last issue, that the largest firm of China Clay producers were now marketing a very fine clay—though the term "colloidal" was disclaimed—has not come altogether as a surprise; but that such a highly purified clay (a sample of which we have seen) has been produced is an achievement which we are convinced will, in time, be highly beneficial not only to the trade but to many industries not at present using China Clay. As Mr. Medland Stocker, who is largely responsible for the production of this clay, pointed out, this highly refined clay will not in any sense displace the ordinary commercial China Clays now being sold, but entirely different uses may be found for the product. Such uses might well be for the manufacture of copying ink pencils, oil and water-colour paints, medicinal uses, the manufacture of rubber goods, etc. Fine kaolin has for some time past been used to a limited extent in medicine, surgery, and pharmacy.

We have in front of us as we write a circular issued by a firm of fine chemical manufacturers who have marketed a fine kaolin, produced by the electro-osmosis method, for the treatment of dysentery, cholera, ulcerative colitis, and similar bacterial infections. It is also used for the preparation of pills, ointments, etc., and the clarification of liquids. The treatment of dysentery and similar internal bacterial infection by the administration of kaolin has been in use in Germany and Austria for some years, and during the war pure kaolin was used in the German and Austrian military hospitals for the treatment of cholera. It will thus be seen that the new product opens up new and interesting channels for its use. The cost of manufacture of this purified clay, we understand, is very high, so that the price is likely to remain at a very much greater figure than the price ruling to-day for the best China Clays. Not all clays appear to yield good results by the processes used, and many are not worth the cost of treatment, which is very intricate and involves great care. At the same time it is believed that the new highly purified clay will take the place of many other high-priced materials. We shall be interested in watching developments of this product, and, as we have already stated several times in this REVIEW, we believe that the so-called colloidal clay has a great future before it, even though it may take some time for manufacturers fully to appreciate its value. The series of articles which we publish, commencing with this issue, on Colloidal China Clay, by Mr. Searle, deals very thoroughly with the matter, and will prove of interest to our readers, who may be encouraged to make further experiments in both the production and uses of this material.

China Clay Employment Limits

THE attitude of the China Clay industry on the ethics of relief schemes for the provision of employment disclosed in the letters read and discussed at the last meeting of the St. Austell Rural District Council, will be endorsed by all true economists. Though the unemployment problem in the China Clay areas of Cornwall and Devon has been very much less acute than in the tin-mining areas further west, no local governing body has approached either in number or value the unemployment relief schemes inaugurated by the St. Austell Council, amounting in the aggregate to over £150,000.

Having regard to the large number of China Clay workers who could not find employment in the industry in consequence of the depression since the Armistice till last year, the China Clay trade has given a tacit support to the Rural Council's policy of providing work by means of Government grants and mortgaging the rates. Now that the crisis is past and as many men as the industry can absorb have been accommodated, the China Clay trade considers the time has come when relief schemes involving further burdens on the rates should no longer be inaugurated as employment measures.

Few will quarrel with either the expediency or appositeness of the China Clay trade's friendly intervention at this juncture; even members of the Rural Council are agreed that it is not their business to go on indefinitely creating relief schemes. In rural areas in which the China Clay industry operates, it is the chief ratepayer, and is called upon to bear the main burden of the relief schemes, which will remain a heavy charge upon it for many years to come. As Mr. J. Hoyle, a China Clay merchant, pointed out, the rates which are levied according to output are an important factor in determining the prices at which the producers are able to sell their clay: the lower the prices, the greater the sales and the more demand for labour to produce the clay.

The chairman of the Rural Council stated in terms almost of reproach that through the introduction by the China Clay producers of labour-saving appliances not so much unskilled labour was required as formerly. The fact is that, but for the more extended use of mechanical appliances in lessening labour costs, the trade would not have been able to maintain prices of clay at their present level, and secured that welcome recovery in trade which it has enjoyed since 1921. While the unskilled labour market has suffered a certain amount of loss through the China Clay trade's new policy, the skilled labour market is being benefited in consequence of the greater demand for machinery and mechanical appliances. In their efforts to cheapen production this result is inevitable.

The suggestion of the Rural Council to confer with those representing the China Clay trade is one which is likely to be acted upon with beneficial consequences.

The Chemistry of Colloidal China Clay

By Alfred B. Searle

There are so many misconceptions as to the nature of colloidal clay in general and of colloidal China Clay in particular that it seems very desirable to deal with the whole subject in a systematic manner. We have, therefore, asked Mr. A. B. Searle to write a series of articles on the colloidal properties possessed by China Clay, both in the form in which it is usually sold and also those special forms which are specifically sold as "colloidal China Clay." Readers will see from the first instalment of Mr. Searle's articles that, in spite of its complexity, the subject is full of interest, and we hope that a careful study of the information given in these articles will lead to results of considerable technical importance.

CHINA Clay was at one time regarded as a comparatively simple substance with a definite chemical formula and certain specific properties, but investigations made within the last fifteen or twenty years have shown that it is in reality a highly complex material and that it possesses a number of properties which can, apparently, only be explained as being due to the possession of "colloidal" properties by some constituent or constituents of the clay. It is probably incorrect to regard any China Clay on the market as wholly colloidal in character, but some of them approach this state very closely, whilst others contain only a small percentage of colloidal material. In the following pages it is proposed to consider in turn certain properties possessed by all colloidal substances and to note how far they are possessed by China Clay. Such a consideration of properties eventually leads to the conclusion that all raw China Clay contains some colloidal material in association with other substances, and that by applying appropriate methods of purification much but not all of the non-colloidal materials may be removed. The properties of the purified clay are then seen to be still more characteristic of colloidal substances, whilst the materials removed during the process of purification are found not to be of the nature of clay at all, but to consist chiefly of mica, quartz and other definitely crystalline minerals. Methods of treatment vary greatly in the extent to which they separate the colloidal material in China Clay and retain or deprive it of its characteristic colloidal properties. Thus, it is possible to produce a China Clay very rich in colloidal matter, but the final product, *e.g.*, that obtained by drying the purified clay, may be inert as regards many of the properties which would be possessed by an active colloid. To some extent these properties are only latent, and may be rendered active by mixing the material with water, but if the drying or other later stages of treatment are of an unsuitable nature, the clay may be rendered permanently inert. In other words, the colloidal material may undergo changes which under some conditions are reversible, and irreversible under others.

The Nature of Colloids

As long ago as 1861, Graham pointed out that some substances, such as salt and sugar, will diffuse through water much more rapidly than other substances, such as gum, starch, gelatin, silicic acid, precipitated alumina, etc. As the former substances are crystalline and the latter are not, Graham proposed to distinguish the two groups by the terms *crystalloid* and *colloid* respectively. The term "colloid" he derived from the Greek word for gum or glue. Graham believed that crystalloids and colloids are essentially different substances, but later experiments have shown that the difference is one of state rather than of chemical composition, and that many crystalloids can be converted into colloids by appropriate treatment. Nor are all colloids necessarily amorphous, for some forms of colloidal gold are certainly crystalline, and the X-ray spectrum of China Clay, recently obtained by W. H. Bragg, suggests that colloidal China Clay is also crystalline. Speaking generally, however, colloids do not show markedly crystalline properties, but more closely resemble gelatin and white of egg in their properties.

A substance is regarded as colloidal when it exists in a sufficiently finely divided state, and possesses certain properties (to be considered in greater detail later) which are analogous to those of other colloids. The degree of fineness varies within wide limits, but its consideration is best deferred until other properties have been noted. A substance may possess colloidal properties under certain conditions, but may lose them under others, as when China Clay is heated to redness. The product is certainly not crystalline, and it is probably, in a certain sense, colloidal, but as it does not possess most of the active properties which make colloids valuable and provide the means whereby they may be recognised, such a product scarcely comes within the scope of the present articles. It may be regarded as an inert colloid which, because of its inertness does not admit of much consideration, except in connection with those products in which inertia is of importance.

In the following pages, attention is concentrated on what may be termed active colloids, though not confined solely to them.

What are commonly known as colloidal solutions consist of two parts or phases—viz., the finely divided particles or dispersed phase, and the medium through which they are distributed, which is termed the dispersion medium or dispersing phase. Thus, in a Scotch mist, the extremely minute drops of water form the dispersed phase and the air the dispersion medium. In the milky fluids known as emulsions, the oil is the dispersed phase, and the water or solution the dispersion medium. Ruby glass is a colloid in which gold is the dispersed phase and the glass the dispersion medium. A porous brick may be regarded as a colloid in which air is the dispersed phase, and the burned clay the dispersion medium.

Whilst at first sight the study of colloids may appear to be remote from matters of interest to clayworkers, the reverse is actually the case, because many of the properties of clays and of such clay products as bricks, tiles, pottery, cement, as well as glass, enamels and other allied materials are related to colloidal phenomena.

Adsorption of Gases or Vapours by Clay

One of the fundamental properties of many apparently solid colloidal materials is their power to adsorb gases or vapours. This adsorption is limited to the surface of such materials, but as they are all porous, their total surface is extremely large as compared with their external dimensions.

Thus, some forms of charcoal will adsorb or condense in their pores (*i.e.*, on their internal and external surfaces) more than one hundred times their volume of gases. The adsorption is sometimes extremely rapid and complete—*e.g.*, a good gas mask will reduce 1,000 parts of toxic gas per million parts of air to less than one part per million in the tenth of a second in which the air is inhaled through the mask. China Clay, precipitated silica, finely ground quartz and alumina do not adsorb gases nearly so well as charcoal, but their power of adsorption is sufficient to show that they possess this characteristic property of colloids to a marked extent. The amount of adsorption varies with the gases or vapours as well as with the adsorbent; thus, China Clay and dry precipitated alumina both strongly adsorb carbon dioxide and water vapour, and in 1909 Rohland reported that unsaturated hydrocarbon vapours are strongly adsorbed by clay. If a sample of China Clay is sufficiently dry and sufficiently fine, it will surge like a liquid, because the film of air around each particle acts as a cushion, and enables the particles to move over each other as though they were suspended in a liquid. If the powder is heated, its mobility is still further increased, though the adsorption usually increases with a fall in the temperature of the dispersion medium.

The increased concentration of the adsorbed gas or vapour at the surface of a solid, ought, theoretically, to increase the rate at which it can react either with the solid or with other gases which may be adsorbed simultaneously. In the case of dry China Clay—which has an ample surface—the catalytic effect is not marked when the clay is cold, and no experiments appear to have been made with it at moderately low temperatures. The effect of red-hot China Clay in decomposing carbon dioxide with liberation of free carbon is well known. The power of dry China Clay to decompose ethyl alcohol, ethylene and

water is known, but the manner in which the reaction is brought about still requires explanation. It appears to be due to the increased concentration of the alcohol adsorbed by the clay. The remarkable catalytic action of red-hot China clay in causing a mixture of hydrogen sulphide and oxygen passed through it to form sulphur and water is due to a similar cause. It is used in the Claus-Chance process for the recovery of sulphur from alkali waste, though as broken fireclay bricks are equally satisfactory, the more costly China Clay is seldom employed. As the same reaction occurs at a lower temperature in the presence of iron oxide, both this substance and firebricks are commonly used.

A similar phenomenon occurs in what is known as surface combustion, in which a mixture of coal gas and air is passed through a diaphragm formed of a porous mass of clay, and burns on the further side of the diaphragm and raises it to a very high temperature at which it becomes incandescent and radiates heat very intensely, and forms a highly efficient heating appliance. W. A. Bone, who first investigated this subject, used fireclay diaphragms, but China Clay diaphragms are superior whilst efficient, but choke more readily as the pores are much smaller. Bone has reached the conclusion that the calcined clay adsorbs or condenses on its surface and in its pores both hydrogen and oxygen. The advantages of this method of combustion are the "cleanliness" and intensity of the heat, the economy in fuel effected due to the minimum quantity of air being used and the large proportion of radiant heat developed.

In all these cases the dry China Clay behaves as a typical colloid, showing in a marked degree the phenomena of gaseous adsorption which is a prominent characteristic of what are commonly regarded as solid colloids—*i.e.*, those with a highly viscous dispersion medium and a gaseous dispersed phase.

II.

Adsorption of Liquids and Solids

China Clay behaves like other colloids in its power of adsorbing various liquids. In the first place, it is wetted by water, alcohol and various other fluids, and for such "wetting" to occur, the clay must adsorb the liquid more strongly than the air which was previously in contact with its surface and filling its pores. A piece of calcined China Clay soaked in paraffin or alcohol adsorbs so much of the liquid that if the latter is ignited it will burn for quite an appreciable time.

The film of water adsorbed around each particle of clay has been estimated at 0·0000002 in., and that around particles of quartz at about half this thickness. As the total quantity of water adsorbed by a piece of China Clay is quite appreciable, the total surface of the clay must be very large.

China Clay adsorbs different liquids to a different extent—*i.e.*, its power of adsorption is selective, and under suitable conditions one liquid will displace another in contact with the clay. For the same reason, a greasy dish is readily cleaned by rubbing it with wet China Clay, and grease may be removed from wool and cloth by rubbing it with China Clay. This use of China Clay is important industrially in fulling cloth. When pressing bricks, tiles and other clay-ware, the press-box and plunger are oiled so as to produce a wetted surface of oil and clay which adheres to the metal far less than a surface of clay and water. The oil is adsorbed by the wet clay as well as by much dryer clay dust, and thus provides the desired surface. China Clay does not adhere to iron and steel nearly so tenaciously as more plastic clays. As plasticity is also a colloidal phenomena (see later), the variable adhesion of different clays to iron is roughly dependent on their colloidal content. The power of China Clay-ware to adsorb water when the ware is dipped in glaze slip—a coating of glaze being left uniformly distributed over the surface of the ware—is another phenomenon showing the colloidal nature of this clay, both in the raw and calcined or fired state.

The manner in which a piece of fired China Clay will adhere to the tongue is well known. This is due to the water being adsorbed by the clay and the air previously contained in the pores being displaced. The pressure exerted by the water appears to be about five atmospheres.

As the adsorption of water by clay must produce an exothermic reaction, it ought to be possible to measure the heat liberated when clay is wetted. This does not appear to have been done, though the rise in the temperature of a mixture of clay and water in a pugmill is very noticeable.

A curious case of adsorption of one solid by another is observable when coarse quartz or grog is mixed with finely ground China Clay. The clay is not distributed uniformly through the pores or interstices of the coarser particles, but most of the clay forms a coating on the quartz or grog, and many of the pores remain unoccupied even though there is more than sufficient clay to fill them. This behaviour of clay gives it great value for use as a filler in the paint, paper, textile and other industries. The greater the proportions of colloidal matter in the clay, the more efficient will it be in this respect. Hence, the remarkable success which has been obtained by the use of specially fine China Clay (the so-called "colloidal clay") in rubber, printers' ink, ultramarine and other pigments, paints, soaps, etc. Pure China Clay appears to be very largely colloidal in character, but this property is greatly increased if the particles of clay are extremely small. Coarser particles have a much smaller surface, and consequently have far less power of adsorption. Apparently, any method which will ensure the China Clay being sufficiently finely divided will increase its adsorbtive power, and therefore its commercial value for the purposes mentioned. Mechanical grinding—if sufficiently intensive, as in the Plauson mill—has the desired effect of producing particles of the requisite small size. Other methods which enable the smaller particles to be separated either by elutriation, air-separators, etc., produce the same effect, but may prove more costly on account of the large proportion of residue which is useless because the particles are too coarse. The effect of very small quantities of alkalies and certain other salts is to enable water containing them to "wet" the clay more completely, and so effect the separation and dispersion of the finer particles of the fine colloidal clay from the coarser inert particles. The fact that two plastic clays will not mix thoroughly has been shown by Rohland to be due to the colloidal nature of the clays. The rates at which China Clay is wetted by water and other fluids are due to a difference in the power of the liquids to displace the film of air previously adsorbed by the clay, and to the power of selective adsorption possessed by the clay. This selective adsorption was also shown by Reinders and others who shook dry China Clay with water, then with one of a series of immiscible organic liquids. The particles of clay must be the finest obtainable, as coarse ones are inert. When China Clay is shaken with water and either carbon tetrachloride, chloroform, butyl alcohol, amyl alcohol or paraffin, much of the clay remains suspended in the water, but an appreciable proportion collects at the interface of the two liquids. If the clay is shaken with water and benzene or benzolene, the greater part of the clay collects at the interface of the two liquids.

III.

Adsorption from Solution

One of the striking properties of China Clay which is due to its colloidal nature is its power of withdrawing soluble salts from their solutions. This is a case of selective adsorption.

As early as 1874 Böttiger showed that when an alcoholic solution of an aniline dye is shaken up with dry China Clay or with kieselguhr, and then with water, the liquid which can be separated by filtration is perfectly colourless, all the dye having been retained by the clay or kieselguhr. Ashley proposed to make use of this phenomenon to measure the relative proportion of colloidal matter in various clays. For this purpose, he shook a weighed quantity, 20 gms., of each clay to be tested, with 1 gm. of malachite green dye and 400 c.c. of water for one hour. The liquid was then allowed to settle overnight, and the amount of dye unadsorbed was determined by comparison with standard solutions of dye.

The amount of adsorption and, therefore, of colloidal matter in the clay is estimated from the reduction in the concentration of the solution of the dye. This is only correct so long as no liquid is retained by the clay, so that the method probably gives low results.

Closely analogous to this is the preparation by Lloyd* of a hydrous alumino-silicate from fuller's earth which adsorbs alkaloids.

* *J. Am. Chem. Soc.*, 1913, 35, 837.

The distribution of the adsorbed salt may be represented by the equation

$$\frac{a^n}{s} = kc$$

where a is the amount of salt adsorbed by s units of the clay, c is the concentration of the saline solution, and k and n are constants which depend on the conditions of the experiment and on the clay used.

The presence of certain salts adversely affects the adsorption, the effect of sulphates being particularly noticeable in this respect. If, however, the sulphates are previously rendered insoluble by the addition of barium chloride, the resultant barium sulphate is quite inert. This is important in connection with the use of certain clays for casting and in the purification of other clays by means of very small proportions of alkalies or other electrolytes.

China Clay not only removes dyes from their solutions by adsorption, it can also adsorb either the base or acid ion (according to circumstances) from a dilute solution of salt. Thus, when a liquid mixture of China Clay and water is filtered, the filtrate appears to be quite neutral to such an indicator as litmus or phenolphthalein, but if a mixture of China Clay and a solution of salt (sodium chloride) is similarly treated, the clear filtrate will be acid to these indicators. The reason is that the salt in solution decomposes into its constituent acid and base ions, and when such a solution is brought into contact with China Clay, the clay adsorbs the base which is thereby removed from solution, leaving free acid ions in the solution. Similarly, if a faintly alkaline solution of phenolphthalein or litmus is mixed with China Clay, the filtered liquid will be acid. Under favourable conditions, China Clay will remove about 1½ per cent. of its weight of lime from a solution of lime in intimate contact with it. The apparently acid nature of China Clay is not due to the clay being truly acid—as might, at first, be supposed—but to its removing the base from its combination with the indicator. A piece of neutral litmus paper left for some time in contact with moist clay will turn red for the same reason. On the other hand, China Clay will remove acid from a dilute solution by a similar process of adsorption, though to a much less extent than it will remove alkalies or bases.

Hence, if China Clay is kept in contact with a base or acid in solution, it will remove some, or possibly all of it by adsorption, the amount so removed depending on the physical condition of the clay and the form in which the base or acid is presented. China Clay can be shown to be either acid or alkaline to indicators, according to the manner in which the test is conducted. Actually, its reaction does not depend on its being either acid or alkaline, but upon its power to remove soluble substances by the physical or, possibly, physico-chemical process of adsorption.

A phenomenon of greater interest with regard to other clays, but which occurs in China Clays brought into contact with saline solutions, is the power of the clay to adsorb some of the salt as a whole, so that when the clay is withdrawn from the solution and dried slowly, some of the salt crystallises on its surface causing what is technically known as "scum." The salts so removed are chiefly sodium, potassium, and calcium sulphates. They form only a very small proportion of the total weight of the dried clay, but as they are largely concentrated on the exterior of the mass, they are readily noticeable, especially if the clay is dark in colour. This formation of "scum" is not wholly a colloidal phenomenon, as it can be produced by any aggregation of pores and, with care, can be formed from a bunch of capillary tubes made of glass, whose power of adsorption is very low.

Coalescence, Binding Power and Sintering

Most soluble substances—if they possess a sufficiently fine texture, will coalesce or "unite" to form a solid mass if the conditions are favourable. The chief difficulties experienced in obtaining complete union are (i) too great an irregularity of the opposing surfaces, (ii) the presence of a coherent film of air which keeps the two surfaces apart and cannot be displaced by ordinary mechanical means. The smaller the particles and the greater the pressure to which they are subjected, the more readily do they coalesce. It appears probable from experiments on the electro-deposition of metals that if particles are sufficiently small, they will coalesce as readily as will drops of liquid. As heating the material causes the film of air at its surface to expand, some substances will coalesce more completely when hot than when they are cold, as in welding, soldering, fritting and sintering. Such coalescence occurs far below the melting point of the material as a whole, but may be due in part to the formation of a more fusible product as the first signs of sintering appear at a lower temperature when the material is exceptionally finely ground. Although substances in the colloidal and amorphous state coalesce more readily than when in the form of crystals of appreciable size, the phenomenon of coalescence is not limited to the colloidal state, and many instances are known where pure crystalline substances coalesce completely when heated, especially if they are also subjected to pressure or to a succession of blows. The problem of sintering is complicated, in the case of clays and allied substances, by the presence of impurities of a lower melting point, and when these are heated they fuse, producing a liquid which "wets" the remaining particles and obscures the phenomenon of coalescence between solids.

Solid substances which coalesce when in contact with each other under favourable conditions show two phenomena which are of great importance in connection with the commercial utilization of clay, viz., "binding power" and "plasticity."

Binding Power

It is difficult to ascertain accurately whether binding power is wholly confined to substances in the colloidal state, but this appears to be the case.

When a colloidal substance is mixed with another non-colloidal substance in suitable proportions the particles of the latter become coated with the former, and a homogeneous mixture is produced consisting of two phases—viz., the colloidal or jelly-like phase in which the more "solid" particles are embedded, the whole forming a highly viscous and tenacious mass. It may be argued that this property of "binding power" might be possessed by any liquid which was sufficiently viscous and so far as true liquids are concerned, the statement would be correct. Clays and many other substances possessing this property cannot, however, be regarded as true liquids. If it is suggested that the binding power is due to a strongly adherent and relatively thick film of water surrounding each of the particles of binding material, this does not alone show the origin of the binding power as the cause of this special film must be shown. If, however, the binding material is recognised as being of a colloidal nature, the existence of the film is readily explainable as will be seen later, when the constitution of colloidal jellies comes under consideration.

For the present, therefore, it may suffice to regard the binding power—*i.e.*, power possessed by moist China Clay to form a plastic mass which remains plastic after being mixed with non-plastic solid materials—as essentially due to the presence of a colloidal jelly in the clay.

The limit of the binding power of a clay is reached when so much matter has been added that the clay is no longer appreciably plastic. In the case of China Clay, the proportion of sand or other non-plastic material which can be incorporated is much less than is the case with some other clays. Hence, China Clay has a relatively low binding power.

This fact appears to be in opposition to the idea that China Clay contains much colloidal matter, but it is probably more correct to say that the difference in the binding power of various clays depends on the activity of the colloidal matter present rather than on the total amount.

Rubber Latex Paper and China Clay

In the printing and paper world the opinion is growing that the use of rubber latex in papermaking will extend rapidly. The two chief advantages of rubber latex are that it increases the strength of the paper and enhances its capacity to resist breaking through folding. From the printers' point of view it has one drawback—it does not absorb the ink so quickly as a non-latex paper. It is a problem that is expected to be solved by the ink manufacturers in the production of a quicker-drying ink. A point of interest for China Clay producers in the manufacture of this class of paper is that rubber latex permits of a higher retention of China Clay. It is not improbable that the use of a larger percentage of China Clay than that used in the paper so far made would overcome the anti-absorbent drawback.

Unemployment Relief Schemes

St. Austell Rural Council asked to Call a Halt

In consequence of the depression of trade which has been experienced by the China Clay industry since the war, the St. Austell Rural Council have embarked upon unemployment relief schemes involving over £150,000 to provide employment. Now that the China Clay trade has been able to absorb a very large proportion of the men they formerly employed, they have written to the Rural Council pointing out the burden these schemes impose upon the industry.

As the letters addressed by the China Clay Employers Federation and the China Clay Producers Association set out what is the attitude of the trade on the question, we give them *in extenso*. The Federation's letter was in the following terms:

"At a meeting of this Federation, attention was called to the very heavy liability being placed on the St. Austell rural district for many years to come by reason of the many large schemes inaugurated by your Council during the last two years for the relief of unemployment in the district. As you are of course aware, the China Clay producers bear a very large proportion of the rates raised within the district, and on them therefore will fall the burden. They recognise that your Council has been faced with great difficulties with regard to the unemployment in the district, and while the slump continued in the China Clay trade, they were prepared to support them in their endeavours to relieve such unemployment by means of the schemes decided upon by the Council, but having regard to the present improved position of the trade, closely approaching that of pre-war days, they now feel that the trade has absorbed practically as much labour as it will require for some time to come, and therefore those at present not absorbed and presumably working on the relief schemes cannot in the natural course of events expect to be employed in the trade. This being so, this Federation feels, and I am asked to write you on the matter, that the problem of finding permanent employment for these men in the district will not be met by means of further relief schemes, but that steps should be taken to allow this surplus labour to be absorbed in a district either at home or abroad, where permanent employment can be secured."

The China Clay Producers Association wrote:

"At a meeting of my Board, the question of the very heavy expenditure now being made in various directions by your Council was discussed, and I am requested to convey to you the unanimous opinion of my directors representing practically the whole trade, that such expenditure must react most seriously on the future prospects and development of the China Clay industry, in view of the already largely increased rates and the prospects of a graduated increase of this burden of rates of which our industry bears so large a proportion.

"My board feels that this is a matter that effects the future prosperity of the China Clay trade, and therefore the prosperity of the whole local community.

"I trust that your Council will give careful consideration to our point of view at a time when so many works have a struggle to exist under present trade conditions."

Long discussion followed the reading of the letters at the meeting of the St. Austell Rural Council on March 9. Mr. E. W. Galley, in emphasising the burden the China Clay industry bears pointed out that they paid between 51 and 52 per cent. of the rates in the five chief China Clay parishes, being assessed in £60,000 of the total assessment of £112,000. The chairman (Mr. F. W. Jenkin, C.C., J.P.) remarked that they had embarked on their relief schemes on the understanding that when things became normal the China Clay industry would be able to absorb the surplus labour, but in consequence of the adoption in the China Clay works of mechanical appliances it was found that they did not now require the number of men formerly necessary in the production of China Clay.

As some members were disposed to charge the China Clay trade with finding fault with what the Rural Council had done, Mr. John Hayle, a China Clay member of the Council, pointed out that the letters were not written in a fault-finding spirit, but as expressing the opinion of people who were heavy ratepayers that the time had come when the burden should not be further increased. Finally, the Council resolved to ask the China Clay bodies concerned if they would be willing to receive a sub-committee to discuss the questions raised in their letters.

China Clay Royalties

To the Editor of THE CHINA CLAY TRADE REVIEW.

SIR,—You ask for your readers' opinions on Mr. Taylor's letter printed in your issue of February 17, 1923, under this heading. My opinion is that Mr. Taylor's letter is inopportune, and might even have been fatal to certain negotiations already on foot between the "Associated" and the Landowners' Federation. Mr. Taylor's grievances are more imaginary than real, and if (as it seems) he means your readers to imply that landowners generally, at the expiration of China Clay leases, confiscate buildings and drys to the value of £10,000, or £15,000, or increase dues up to 7s. a ton, or even by 50 per cent., I say that nothing of the sort occurs in reality. I challenge the allegation that any grantee pays 7s. a ton in dues. The average is not as great as half that figure.—Yours faithfully,

WALTER H. GRAHAM,
Secretary, China Clay Owners Federation.

St. Austell, March 7, 1923.

Plauson Colloid Mill and China Clay Industry

AT the British Industries Fair we were shown the Plauson Colloid Mill, by means of which it is claimed a colloidal china clay can be produced. Samples of these colloid clays were on exhibition, and it was claimed that the clay would hold in suspension for three months or more. The machine shown was quite a small one, and would produce about a ton an hour of the clay, but as liquid constitutes one of the operative elements, this machine is not adapted to dry grinding.

The Plauson Colloid Mill grinds, but it differs from all other mills by utilising a combination of mechanical with chemical forces. By the aid of chemical agents known as "dispersators" in conjunction with mechanical power, the consumption of the latter is considerably reduced, while hitherto unattainable results are realised. In place of friction and crushing between relatively slowly moving elements, smashing by hydraulic action between a moving element revolving at a minimum speed of 3,000 r.p.m. between two stationary anvils, in conjunction with "dispersators," effects with many substances a colloidal fineness of disintegration, while intensive mixing and permanent emulsifications are effected with great rapidity.

Those of our readers who may be interested in the mill can obtain full particulars from the Plauson's Mill and Filter Press, Ltd., 17, Waterloo Place, Pall Mall, London, S.W.1.

Fowey Shipping in February

THE port of Fowey has experienced one of the worst gales for many years. Heavy seas prevented shipping, and comparatively few boats were loaded during the latter week of last month. Mr. J. P. Carter, one of the directors of Messrs. Toyne, Carter & Co., informed our correspondent that shipping for the moment was somewhat slack, no doubt owing to the heavy storms keeping the ships back, or it may be that the trade generally is a little quiet; it usually is at this time of the year. No. 3 Jetty is under repairs and will probably be stopped for about 10 days. The No. 4 Conveyor Jetty continues working full speed night and day. The new Jetty No. 8 is rapidly approaching completion and it is hoped to have it working in the early autumn. Some of the belts are already in place, and the large cylinder which forms the silo is now being lowered into place. The dredging operations continue as rapidly as possible as weather permits, and the dredger is now in a position higher up the harbour, working by the Town Quay. The shipments at Fowey for the month of February amounted to 49,821 tons, being an increase of over 10,000 tons on the corresponding period of 1922. There was a marked falling off, however, from the preceding month by 13,645 tons, which was accountable for by the prevailing weather conditions. Several large boats visited the port, including the Japanese s.s. *Washington Maru*, which was loaded with 6,600 for Philadelphia; Dutch s.s. *Merwestroom*, 1,300 tons, to Amsterdam; British s.s. *Sotero*, 1,000 tons; and s.s. *Ravensport*, 500 tons, for Italy; Japanese s.s. *Victoria Maru*, 5,500 tons, for Philadelphia; Norwegian s.s. *Aagot*, 5,000 tons, to Portland, Maine; Danish s.s. *Sophia*, 1,450 tons, to Genoa; Dutch s.s. *Spaarestroom*, 1000 tons, for Amsterdam; *Yeu-Juku Maru* was loading 6,500 tons for America. There were about 70 smaller craft.

China Clay Notes and News

U.S.A. Interpretation of c.i.f.

It has been held in New York, Pennsylvania and some other centres that under c.i.f. contracts title passes to the buyer upon transfer of documents, even though it be stated in the contract that delivery is to be made at destination.

Canadian Colloidal Clay

The Canadian China Clay Co., at St. Remi, Quebec, has been investigating the possibilities of colloidal treatment of kaolin, and as a result is disposing of considerable quantities in the rubber industry. The suspension of the clay by colloidal means permits of the removal of impurities, providing a specially adaptable clay for incorporation.

Tripoli Earth for Glazing China

In Tacna Province, Chile, deposits of high-grade tripoli earth (Kieselguhr) have recently been discovered. A French mining engineer gave as his opinion that the tripoli earth in question was of the best quality, and especially fine for glazing china. Several trial shipments, aggregating 25 metric tons, have been made to South Chile. In addition to its use as stated above, it may be used in the manufacture of dynamite.

Good for Common China Clay

On the basis of values, although we imported more than four times the quantity of paper than we exported, the money-value was only twice as much. The deduction to be drawn from these figures is that our paper mills are leaving the cheap paper trade more or less to importers, and are themselves maintaining their lead in the better-classes of paper. One factor of the growth of the foreign and Colonial cheap paper trade interesting to China Clay producers is that the makers are requiring an increasing quantity of our common China Clays in the production of it.

Water Glass and Fillers in Coated Papers

A Continental paper-making expert says that both in sizing pulp with water-glass and in working this material in conjunction with the sizing agents in coating paper, good results were obtained on the paper machine as far as the suction was concerned. There was no sticking at the presser, and a smaller consumption of wet felt was noted. Rapid and complete sedimentation took place in the waste waters from the paper machine. The paper was found to possess greater strength and a better feel. This paper can be sized properly with a greater use of filling materials.

A Warning Note

The *British Export Gazette* continues to warn the home producer of China Clay of possible future competition. It says:—"With Canada and the U.S.A. 'getting busy' on China Clay development, not to say other countries like Malaya, it would seem to indicate that unless the Cornish producers similarly bestir themselves and keep their mines going to their fullest capacity by giving the widest publicity to the manifold uses to which their product can be put, and so induce an increased demand for it on the part of industrialists, the threatened competition to which we have referred in previous issues will inevitably result in a reduced output in the near future."

Effect of Grinding on Silica Bricks

As certain grades of China Clay are used in the manufacture of silica bricks, the results of an investigation recently made by American potters to ascertain the influence of grinding (for 10, 15 or 20 minutes) on the properties of silica bricks are interesting. With the firing temperature ranging from cone 11 to cone 19, from 15 to 20 minutes' grinding seemed to be most desirable, though fine grinding improved the appearance of the bricks and slightly increased the strength. The porosity also of silica bricks is not seriously affected by the time of the grinding of the material. The firing temperature practically governs the final strength of silica bricks as well as the amount of permanent residual expansion.

Rate of Settling of Clay Suspensions

The rate of settling of clay is thought to be an important matter in connection with the use of clays as a filler in paper-making. The rate of settling of clay in a medium is to a certain extent dependent on the hydrogen-ion concentration of the suspending medium. The rate of settling of six clays has been studied over a wide range of hydrogen-ion concentrations. For each clay-water mixture, there is a definite hydrogen-ion concentration at which the rate of settling will be a maximum, and also a definite concentration at which this rate is a minimum. In the purification of clay, these two points should be known in order to effect the separation of clay particles from quartz and mica particles most efficiently.

Paper Imports and Exports in 1922

The tonnage of paper imported last year increased from 553,600 tons in 1921 to 553,600 tons in 1922, roughly nearly 54,000 tons in excess of 1913. The greatest increases were from Sweden, Norway, Canada, and Newfoundland. From Sweden the tonnage of printings and writings increased from 10,975 to 32,450 tons, from Canada paper of the same class increased from 2,600 to 9,484 tons, and from Newfoundland from 37,285 to 55,438 tons. Sweden's biggest increase was in wrapping paper of all kinds, which increased from 31,600 to 52,900 tons. Norway, Germany and Canada also showed big increased exports of the same class of paper to this country. Our exports of paper increased from 73,171 tons to 122,751 tons, printings, writings and wrappings being mainly responsible for the increase.

A Great Future for the Industry

Mr. Thomas, editor of *The Cornish Post* for very many years, says he thinks the China Clay industry has a great future before it, and that he would like to see improvements at Penzance (where he lives) the necessity of which becomes obvious to anyone who resides in that town a couple of days. Mr. Thomas can claim to hold a unique position as a Cornish publicist, and the staff which worked with him at the commencement 20 years ago, under his newspaper proprietorship, is, to a large extent, the staff which works for him to-day—a sure sign of the bonds of real affection and esteem prevailing between them. In the last 20 years Mr. Thomas passed through the episodes of the Jameson raid, the Boer War, and the Great War. Perhaps no better synopsis of the former has been penned than that which appears in the issue of the *Cornishman* in which his 20 years' reminiscences have appeared.

Mr. C. H. Knight and U.S.A. Immigration

The National Association of Manufacturers of New York are evidently determined to remove the restrictions placed on emigration. Mr. C. H. Knight, the President of the Paper Makers' Importing Company of Easton, Pa., when asked for his views on the subject said: Most certainly, the subject of immigration must be opened up before the expiration of the present restrictions in July, 1924. Reports from all sections indicate a shortage of common labour, and unless Congress is made to realise the seriousness of the problem facing the industry a grave and dangerous shortage of unskilled labour particularly will result. Our committee on immigration is working at the present time on a set of immigration principles, which manufacturers can support before Congress at the first opportunity. We are not in favour of laws which will permit an influx of unassailable aliens into the country, but we must receive a larger supply of labour if we are to prevent a recurrence of war-time conditions.

Bristol China

Mr. C. D. Hellyar, writing in *The Western Daily Press* on the above subject, says, "Now that the industries of Bristol have become so many and varied we are in danger of forgetting that once the city had a great name for a product rarely connected with it to-day. In modern times the trade of potting seems inseparable from Staffordshire and the Five Towns of Mr. Arnold Bennett; but the old firm of Messrs. Pountney and Co., Ltd., still worthily perpetuates the former reputation of Bristol as a centre of the potter's trade in the more plebeian earthenware as well as porcelain.

"Lately attention has been drawn to the Delft and coarser wares of the local factories rather at the expense of the more refined products, for, though undoubtedly charming in its

own way, no one can deny that Delft ware lacks the fragile delicacy of china. The peculiar interest of Bristol china lies in the fact that it is what collectors term 'true' porcelain as distinct from 'artificial'; that is to say it was manufactured from China Clay and china stone—no kaolin and petuntze to use the old Oriental words—and not from a mixture of white clay with bone, sand, and other ingredients."

Million and a Quarter Tons per Annum

This is the quantity of China Clay the mines in Cornwall and Devon are capable of turning out annually with their present plants and equipment. It is not the limit of what the deposits are capable of yielding, for experts claim that the extent both in area and depth of the China Clay fields is such as to make them practically inexhaustible. The occurrence of these deposits in a more or less continuous belt, with the advantages that accrue therefrom through their development within a comparatively compact area, and their proximity to the seaboard, give the British product tremendous natural advantages over so-called foreign China Clay deposits. Abundance of water is another natural advantage that the English China Clay mines possess, its purifying effect upon China Clay being incalculable.

There has been a lot written lately about the threatened competition of foreign clays. That competition has to be watched, and is being watched, but in having to compete with a raw material of the established reputation of English china clay, produced and delivered to destinations under the most economical conditions, exploiters of foreign clays, with all the capital outlay entailed in opening new mines under post-war conditions, will have their work cut out to displace the home product. China Clay is coming into its own again if the producers will broadcast its virtues.

St. Austell off the Map

The prestige of St. Austell as a town of importance was assailed at the recent meeting of the St. Austell Chamber of Trade. A prominent member remarked that if they looked on the map published by the London and South Western Railway they would not find St. Austell marked. The Great Western Railway had also issued a map in connection with the recent amalgamation, and there again St. Austell was not located. The increasing importance of St. Austell as a commercial centre is evident by the large number of offices of the principal china clay producers, including the English China Clay, Ltd., Messrs. H. D. Pochin and Co., and Varcoes, Ltd. Other firms represented in the town are: Messrs. John Lovering and Co., Messrs. Parkyn and Peters, Messrs. North and Rose, the Burthy, Treskilling, Trethowal and Carbis China Clay Companies; the West Carclaize, Mid-Cornwall, Trethurgy, and Gaverigan China Clay Companies; Messrs. Grose and Stocker, the Goonvean and the St. Dennis and Parkindillack China Clay Companies, the United China Clay Co. and the Bloomdale China Clay Co., the Alseveir China Clay Co., the Great Central, and West Treviscoe, Gears, Rosevear, China Clay Companies; Messrs. Singleton and Birch, the Gover China Clay Co., the Goonamarth China Clay Co., the Anchor China Clay Co., Ltd., the European office of the American Paper Makers Importing Co. for China and Ball Clays, the Meath, North Devon Ball Clay, Co., and other firms are realising the advantages of centralisation, and are securing office accommodation in the town. The Associated Clays, Ltd., have a fine old mansion situate in picturesque grounds in the heart of the town for official work and meetings.

Light Clay Refractories

The problem of making a light silica brick and at the same time ensuring its durability is one that has been closely investigated by an American expert, W. F. Beecher, who, in a paper in the American Ceramic Society's journal, has given the results of his experiments. The seven bricks investigated contained varying percentages of refractory clay, kaolin, regular grog, and sawdust, comparative tests being made with five other classes of bricks. Summarised, the conclusions arrived at were (1) the working properties and drying behaviour of a fireclay mixture are affected by additions of sawdust in the same manner as by additions of grog; (2) between 15 and 20 per cent. sawdust may be added to mixtures of the type studied without appreciably affecting the total shrinkage; (3) raw kaolin increases the drying and burning shrinkages, but may be used without harm up to about one third of the plastic clay content; (4) not more than 45 per cent. sawdust can be added for a workable mixture, and the practical limit is about 40 per cent.; (5) at least 45 per cent, plastic clay (not more than 15 per cent. kaolin) is necessary for proper working qualities. The weight of the bricks depends largely on the amount of combustible material added, but porosity and apparent specific gravity of the clay used has important influence also; (7) in open-burning mixtures, addition of sawdust increase the porosity of burned bricks by an amount equal to about half of the volume added; (8) bricks with better insulating qualities seem to spall the least; (9) no relation is apparent between porosity and thermal insulation; (10) about 4 lb. seem to be the minimum weight for a light brick to compete against standard firebricks in order to retain working properties good enough for commercial manufacture. The load test seemed the surest means of judging those bricks for the light bricks compared favourably with the commercial bricks in all other tests; (12) the results indicate the possibility of producing on a commercial scale very satisfactory firebricks of very low weight.

Captain Denis Shipwright, M.P.

Capt. Denis Shipwright, M.P., was among those who were presented to His Majesty at the levee at St. James's Palace, on Tuesday.

Salesmanship

To the Editor of the CHINA CLAY TRADE REVIEW.

SIR,—You ask me to tell you what constitutes good salesmanship in the China Clay trade, but the trial to every salesman is to put into practice what he knows or believes to be effective. Someone has told us that the world is a stage and we but actors upon it, and in very truth a salesman must be everything to everyone. Without losing his own dignity or beliefs, he feels that he can best secure his clients' interests by ascertaining their own outlook upon life and points of view. Having approached the subject in this manner the salesman is in a position to place before the buyer exactly what he requires and is looking for. In the United States of America this attitude is brought to a finesse that is hardly appreciated in Europe. Not only does the salesman over there use his best efforts to obtain the purchaser's points of view, but the purchasing agent strives all he can to get at the salesman's standing and personal integrity and knowledge of the product he proposes to sell.

With these few remarks the writer has tried to indicate a personal quality or talent which is essental to a successful salesman. It may be an inherent talent or it may be a latent talent to be developed. Certain it is, the salesman during such time as he is actively engaged upon a sale should have a magnetism about him, and for the time being be mentally as good as or better than he to whom he is making his sale. The salesman should also know his subject from A to Z. Not only should he be fully acquainted with the process of production and all the varying qualities of China Clay, but he should be well informed upon the manufacture of the goods for which he is proposing to introduce China Clay. His knowledge of such and the effect of clays in different factories can be very beneficial to him in honestly making recommendations to others.

In these remarks I have so far referred only to the salesman who comes into personal contact with the buyer. There is, however, the correspondence and propaganda side to sales. People in this country, and perhaps particularly those in the China Clay industry, are probably far behind the Yankee in their appreciation of the importance of well-considered and frequent correspondence with definite information of one's product for sale. Goods for sale when pictorially illustrated are most convincingly impressed upon the minds of buyers.

An effective correspondent, who can make quotations and follow same up regularly and without intermission, is not met with so frequently as one might suppose. To leave only a pleasant sensation and atmosphere with those receiving quotations and follow-ups requires a natural talent well developed. A letter as much as a personal interview should carry the impression to the recipient that he is all important, however small his requirements may be.—Yours, etc.,

CHINA CLAY SALESMAN.

Industrial and Trade Reports

(From our Own Correspondents and Other Sources)

Great Britain

The Home Paper and Pottery Industries

It is a good sign of the growing demand for home-made paper that several big paper-making firms are extending their plants and mills. This is particularly noticeable in Kent. At Aylesford, on the Medway, Messrs. A. E. Reed and Co., Ltd., have recently started up the first section of their mill. Papermakers describe it as "the most up-to-date and finest-equipped mill in the country." Messrs. Edward Lloyd, Ltd., have recently started on the erection of a new mill near their present one at Sittingbourne. The first section is to be equipped with two machines, each making a web of paper 215 in. wide, and capable of turning out 800 tons of news print per week.

The potteries producing general ware, or china, have been active, and when all the potteries manufacturing sanitary ware have composed their differences with their employees, a much greater volume of raw materials will be called for, including, of course, china and ball clays.

Manufacturers in the pottery districts are eagerly looking forward to the placing of orders from America, which is usual about this period of the year. With increased orders it is hoped that some of the many unemployed in the district may once more be busy. It is sincerely to be hoped that the question of wages between the employers and employees may be satisfactorily settled and that no stoppage of work may ensue through this cause.

North and Midlands.

Entering into March it must be admitted that so far as the cotton and pottery industries are concerned the expected improvement has not materialised.

With regard to the Lancashire cotton trade the real or artificial shortage of American cotton supplies has created a feeling of anything but security. Following a steady rise in the price of raw cotton the spinners are unable to quote yarn prices which are likely to promote increased business with the weavers, and the tone on the Manchester Exchange has for the last week or two been a very dismal one. As a counter-move the two powerful Spinners' Associations are strongly recommending their members to cut down output by one-half, and whilst this action has not been at the moment definitely decided on, it seems almost certain of adoption.

Although such a procedure means a big sacrifice on the part of those manufacturing spinners with sufficient work to keep things going, it really is the only weapon which can be used to counter those who use every means to exploit an industry with the manipulation of its raw material. That the tactics of the spinners will have the desired effect is to be earnestly hoped for, it being generally recognised that cheaper yarn and cheaper cloth must reach the market before any big buying begins.

The last month, unfortunately, has not brought increased prosperity to the Pottery district, and the fact that the manufacturers, both china and earthenware, are appealing to their operatives to accept the substantial reduction of 20 per cent. in wages would appear to emphasise this fact.

The associations of employers and workers are at present endeavouring to come to an arrangement which everyone hopes will carry on the good feeling between masters and men which has existed in the pottery trade for several years.

The Pottery Section of the Trades Exhibition recently held in London has been well supported by Staffordshire manufacturers, and although no big business results from the Exhibition itself are reported, the potters have made a brave show, the benefits from which may materialise later.

Coal and iron both report improvement, with an unsettled feeling regarding labour in the first-mentioned industry.

Paper trade in North and Midlands must be considered satisfactory, the esparto mills in Scotland doing especially well, aided, no doubt, by the favourable comparative price of esparto grass with wood pulp.

United States of America

Imports of English China Clay

It was reported in the clay market that conditions as a whole are very good in that market at the present time. A great amount of English clay is now coming over, and it is generally reported in the clay market that since the beginning of the year the demand has taken a big jump. In comparison with last year at this time, authorities and close followers of the clay market reported a tremendous improvement. Prices hold very steady. Available quotations are given below :—

English clay, ex steamer, per ton....	14·00 to 20·00
Domestic clay, washed, per ton	8·00 to 10·00
Domestic clay, unwashed :	
No. 1, per ton	6·00 to 7·00
No. 2	5·00 to 6·00

Reports from every part of the country, showing that the manufacturers of paper and pulp and the paper merchants are enjoying wonderful prosperity. From every indication the present briskness in this industry must be considered nothing less than a boom that should continue throughout this year. This prosperity foreshadows the most successful and biggest convention that has ever been held by the American Pulp and Paper Association, and is a good omen for the first annual paper exposition which will be held simultaneously with the convention of the manufacturers and distributors of paper and pulp in New York City during the week commencing April 9.

Canada

In the Eastend-Ravenscrag district the clays are of the earthenware and stoneware types highly suited to the manufacture of Rockingham, yellow-ware, and a wide range of stoneware, including chemical. These particular clays are well located in the matter of a supply of pure water, transportation, and their nearness to the great semi-bituminous coal fields of Southern Alberta.

There are present in the district clays of a wide range of physical properties, both in the raw and burned condition, which permit of close control in body mixtures. In the immediate vicinity of Eastend there are at least two large deposits, easy of inspection, from which not only have tests been made, but many car loads of clay have been shipped to Medicine Hat, and there manufactured into creditable and extensive lines of cooking and stoneware for the Eastern Canadian market.

Pottery Clay Samples

Samples of pottery clay taken from Lilloet, Central British Columbia, have been declared of the very finest quality by an expert at Portland, Oregon. He declared that samples sent to him were better than any he had seen in Western America.

Germany

Paper Industry

In the paper industry the long-feared slump appears to have begun. The inland market was practically stagnant, and sales to foreign countries met with difficulties. For this reason the high export duties are regarded as intolerable.

The Ceramic Industry

The position of affairs in the Fine Ceramic Industry in Germany has just been set forth by the Union of Ceramic Works. It is complained that the difficulties in obtaining inland coal has considerably increased, and similar trouble was suffered in the procuring of raw materials such as kaolin. Greater still are the difficulties in obtaining raw materials from abroad, in view of the present standing of the mark. Particularly sharp is the crisis in the Bavarian ceramic industry, which is almost entirely dependent on supplies from Czecho-Slovakia. On the other hand, the demand both from inland and abroad has considerably fallen away, the reduction in foreign orders being greatest. The result, in most factories, has been reduced working hours.

Shipping and Export News of the Month

We give below the latest particulars relating to arrivals and sailings of ships engaged in the China Clay Trade, at the principal British clay ports. Registered exports of China Clay with countries of destination, and other shipping and export matters are dealt with.

Fowey Shipping—February 1923

Arrived.		Vessel's Name.	Sailed.	
Feb. 1,	S.S.	*Brier Rose*	Feb. 6,	Weston Point
Feb. 1,	S.S.	*Nigretia*	Feb. 6,	Rouen
Feb. 2,	S.S.	*Suffolk Coast*	Feb. 3,	Liverpool
Feb. 2,	S.S.	*Blush Rose*	Feb. 13,	Preston
Feb. 3,	S.S.	*Mersey*	Feb. 8,	Preston
Feb. 3,	S.S.	*Sotero*	Feb. 14,	Genoa
Feb. 4,	S.S.	*Embleton*	Feb. 10,	Bo'ness
Feb. 5,		*Pet*	Mar. 8,	Weston Point
Feb. 5,	S.S.	*Main*	Feb. 14,	Brussels
Feb. 6,	S.S.	*Cornish Trader*	Feb. 14,	Brussels
Feb. 6,	S.S.	*Victoria Maru*	Feb. 20,	Philadelphia, U.S.A.
Feb. 7,		*Minerva*	Feb. 23,	Odense
Feb. 8,	S.S.	*Artificer*	Feb. 14,	Ridham
Feb. 8,	S.S.	*Trader*	Feb. 14,	Grimsby
Feb. 8,	S.S.	*Jarrix*	Feb. 14,	Antwerp
Feb. 9,	S.S.	*Rayford*	Feb. 15,	Methil
Feb. 9,	M.V.	*Anni*	Feb. 14,	Kirkcaldy
Feb. 9,	S.S.	*Ribbledale*	Feb. 14,	Liverpool
Feb. 9,		*John Sims*	Feb. 23,	Berwick
Feb. 9,		*Emu*		
Feb. 9,	S.S.	*Multistone*	Feb. 15,	Sunderland
Feb. 9,	S.S.	*Watchful*	Feb. 15,	Newlyn
Feb. 9,	S.S.	*Hawthorne*	Feb. 15,	Gravesend
Feb. 9,	M.V.	*Garthavon*	Feb. 15,	Par
Feb. 10,	M.V.	*Mary Peers*	Feb. 14,	Plymouth
Feb. 10,	S.S.	*Queenie*	Feb. 17,	Fleetwood
Feb. 13,	S.S.	*Beeston*	Feb. 16,	Garston
Feb. 13,	S.S.	*Allanwater*	Feb. 17,	Liverpool
Feb. 13,	M.V.	*Earl Cairns*	Feb. 14,	Plymouth
Feb. 13,		*Wega*	Feb. 27,	Tayport
Feb. 13,	S.S.	*Falmouth Castle*	Feb. 16,	Runcorn
Feb. 14,	S.S.	*B.W. III.*	Feb. 19,	Ghent
Feb. 14,	S.S.	*Guelder Rose*	Feb. 19,	Preston
Feb. 14,	S.S.	*Pansy*	Feb. 17,	Preston
Feb. 14,	M.V.	*Hieronimus*	Feb. 20,	Drammen
Feb. 15,		*Flying Foam*	Feb. 24,	London
Feb. 15,		*Aneriod*		—
Feb. 15,	S.S.	*Smaragd*	Feb. 21,	Rouen
Feb. 15,	S.S.	*Guardian*	Feb. 17,	Gravesend
Feb. 15,		*James Postlethwaite*	Mar. 6,	Greenhithe
Feb. 16,		*Miarka*	Mar. 3,	Gijon
Feb. 16,		*Amanda*	Feb. 21,	Charlestown
Feb. 16,	S.S.	*Ualan*	Feb. 23,	Ridham
Feb. 17,	S.S.	*Brier Rose*	Feb. 21,	Runcorn
Feb. 18,	S.S.	*Moss Rose*	Feb. 24,	Runcorn
Feb. 18,	S.S.	*Snofrid*	Feb. 23,	Leith
Feb. 18,		*C.V. Petersen*	Mar. 3,	Mevagisey
Feb. 18,	S.S.	*Aagot*	Feb. 27,	Portland, Me.
Feb. 18,	S.S.	*Ravenspoint*	Feb. 24,	Genoa
Feb. 20,	S.S.	*Sophie*	Feb. 27,	Genoa
Feb. 19,		*John*	Mar. 8,	Gijon
Feb. 20,	S.S.	*Mellanear*	Feb. 27,	Grimsby
Feb. 20,	S.S.	*Nigretia*	Feb. 26,	Antwerp
Feb. 21,	S.S.	*Coome Dingle*	Feb. 28,	Bristol
Feb. 24,		*Ryelands*	Mar. 1,	Charlestown
Feb. 24,	S.S.	*Spaarnestroom*	Feb. 28,	Amsterdam
Feb. 24,		*Elisabeth*	Mar. 8,	Penzance
Feb. 25,	S.S.	*Mary Aiston II.*	Feb. 28,	Gravesend
Feb. 25,	S.S.	*Yeifuku Maru*	Mar. 8,	Philadelphia, U.S.A.
Feb. 28,	S.S.	*Blush Rose*	Mar. 2,	Preston
Feb. 28,	S.S.	*Overton*	Mar. 1,	Aberdeen
Feb. 28,		*Rhoda Mary*	Mar. 7,	Runcorn

Par Harbour Shipping—February 1923

Arrivals

Date.		Vessel's Name.	From.
February 5 ...		*Lilla*	Salcombe
February 9 ...	M.M.	*Garth-Avon*	London.
February 12 ...	S.S.	*Alberta*	Kingsbridge
February 13 ...		*Lady Agnes*	Porthoustock
February 15 ...	S.T.	*Countess*	Fowey.
February 28, 1922		*Henrietta*	Mevagissey
February 17 ...	M.V.	*Phœnix*	Fowey.
February 19 ...	M.V.	*Camborne*	Plymouth
February 20 ...		*La Revanche Hennesbout*	Garston
February 20 ...	S.T.	*Gallant*	Fowey.
February 25 ...		*Lizzie Trenberth*	Mevagissey

Sailings

Date.		Vessel's Name.	Destination.
February 3 ...		*Weser*	Antwerp
February 3 ...	M.V.	*Olive May*	Rochester
February 3 ...	S.S.	*Holmwood*	Penarth
February 3 ...	S.S.	*Pulteney*	Hull
February 5 ...		*Pet*	Western Point
February 14 ...		*Flying Foam*	London
February 14 ...		*James Postlewaite*	London
February 14 ...		*Lilla*	Ardrossan
February 14 ...	M.V.	*Garth-Avon*	Preston
February 14 ...	S.S.	*Alberta*	Gravesend
February 15 ...	S.T.	*Countess*	Fowey
February 19 ...		*Henrietta*	London
February 19 ...	M.V.	*Phœnix*	Plymouth
February 20 ...	S.T.	*Gallant*	Fowey

Charlestown shipping received too late for publication.

Par Harbour Tide Table, March 1923

(Greenwich Mean Time throughout.)

Day of Week.	Day of Month.	Morning.	Afternoon.	Height.
Thursday	1	3.44	4.13	12.2
Friday	2	4.39	5.3	13.2
Saturday	3	5.26	5.49	13.7
SUNDAY	4	6.11	6.33	15.2
Monday	5	6.54	7.15	14.5
Tuesday	6	7.36	7.57	14.3
Wednesday	7	8.18	8.39	13.7
Thursday	8	9.0	9.21	12.8
Friday	9	9.44	10.8	11.7
Saturday	10	10.36	11.7	10.7
SUNDAY	11	11.44	—	9-11
Monday	12	0.25	1.9	9.11
Tuesday	13	1.54	2.37	10.5
Wednesday	14	3.15	3.45	11.3
Thursday	15	4.11	4.34	11.11
Friday	16	4.55	5.15	12.5
Saturday	17	5.34	5.51	12.8
SUNDAY	18	6.8	6.24	12.10
Monday	19	6.39	6.53	12.11
Tuesday	20	7.6	7.20	12.9
Wednesday	21	7.34	7.48	12.5
Thursday	22	8.3	8.19	11.11
Friday	23	8.34	8.49	11.5
Saturday	24	9.6	9.25	10.9
SUNDAY	25	9.48	10.15	10.1
Monday	26	10.46	11.22	9.7
Tuesday	27	—	0.2	9.6
Wednesday	28	0.45	1.28	10.1
Thursday	29	2.8	2.45	11.1
Friday	30	3.19	3.47	12.3
Saturday	31	4.13	4.37	13.4

H. L. VICARY, Harbour Master.

Registered Exports of China Clay

RETURNS showing the registered exports of China Clay from the United Kingdom to each country of destination for the month ending February 28, 1923:

Countries.	Quantity. Tons.	Value. £
Sweden	1,220	2,440
Norway	2,328	3,155
Denmark	459	1,262
Germany	617	1,798

Netherlands	2,775	6,407
Belgium	5,287	11,328
France	6,268	13,601
Switzerland	58	200
Portugal	10	40
Spain	1,154	3,924
Italy	3,207	7,572
China	4	30
Japan	54	228
U.S.A. (Atlantic)	37,617	89,185
U.S.A. (Pacific)	824	3,290
Peru	10	40
Chile	3	10
Brazil	14	64
Argentine Republic	255	1,015
India	1,172	4,530
Bengal	25	100
Victoria	8	37
Canada	25	69
British West Indies	12	33
Total foreign countries and British Possessions	63,406	150,353

Exports to Antwerp and Brussels

The following were among the principal arrivals of China Clay, at Antwerp and Brussels during February :—

ANTWERP.

From				Tons.
Fowey	M.S. *Lydia Cardell*	Feb.	4	350
Fowey	S.S. *Ernrise*	Feb.	5	850
Fowey	S.S. *Marnix*	Feb.	4	700
Charlestown	S.V. *Water Witch*	Feb.	6	320
Teignmouth	M.S. *Mayals*	Feb.	5	354
Poole	M.S. *Thalatta*	Feb.	6	120
Par	S.V. *Weser*	Feb.	7	293
Plymouth	M.S. *Record Reign*	Feb.	18	300
Fowey	S.S. *Yarrix*	Feb.	17	600
Teignmouth	S.V. *Carmenta*	Feb.	22	285
Fowey	S.S. *Nigretia*	Feb.	28	620

BRUSSELS.

Fowey	S.S. *Waterway*	—		955

February China Clay Deliveries

THE following are returns of the deliveries of China Clay and China Stone throughout February :—

Port.	Tonnage.
Fowey	49,821
Par	3,324
Charlestown	3,000
Plymouth	798
Truro	238
Penzance	303
Falmouth	74
	57,558 against 45,069 in February, 1922.
Rail deliveries	3,699 ,, 2,980 ,, ,,
Total deliveries	60,954 ,, 48,049 ,, ,,

Seeing that February was a three days shorter month than January, the ratio of deliveries have been well maintained. Since the end of the month there has been a big falling off of shipments in consequence of which night loading at the jetties at Fowey is being temporarily suspended. The slump applies to practically all shipping, shipments to America being most seriously affected. The reason is traceable to the great demand for tonnage for coal cargoes to Germany, the heavy freights inducing China Clay buyers to hold up their orders until the freight market becomes normal again. It is believed that the lull in shipping is only temporary.

From Teignmouth to Leith

THE Danish schooner *Abo*, from Tiegnmouth to Leith, with a cargo of Ball clay, encountered a storm of almost unparalleled severity, and after a voyage extending over 29 days she arrived safely at Leith. On two occasions the vessel was in sight of the Firth of Forth, but was driven seaward by the fury of the gale nearly 160 miles out of its course.

Commercial Intelligence

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

EVANS, William (trading as DENBIGH POTTERY CO.), Bath Street, Stoke-on-Trent, pottery and earthenware manufacturer. £41 18s. 5d., December 18; and £10 1s., December 10.

WHITEHEAD, John, 281, Waterloo Road, Burslem, earthenware manufacturer. £11 12s. January 18.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ASHFORD AND NACCOLT BRICK TILE AND POTTERIES, LTD. (late ASHFORD AND DISTRICT BRICK AND TILE CO., LTD.). Registered January 19, £2,000 mortgage dated January 15, 1923, to Mrs. E. A. Kingsford, Welldean, Ashford, Kent; charged on lands and premises at Naccolt, Wye and Willesborough. *£5,000. January 15, 1923.

BARTON POTTERY, LTD., Torquay. Registered January 29, £2,000 debentures; general charge.

BODELVA CHINA CLAY CO., LTD., St. Austell. Registered February 3, £500 debentures, part of £1,000; general charge. *£1,600. May 19, 1922.

CENTRAL CORNWALL CHINA CLAY CO., LTD., St. Blazey. Registered February 13, £1,000 debentures, part of £25,000; general charge. *Nil. January 7, 1922.

GOONAMARTH CHINA CLAY CO., LTD. Registered December 18, £2,500 debentures; general charge. *£5,000. March 27, 1922.

NORTH WALES BRICK AND TILE CO., LTD., Liverpool. Registered February 20, charge, to Barclays Bank, Ltd. securing all moneys due or to become due to the Bank; charged on lease of clay and brickworks, Pentreclawdd, Ruabon. *Nil. January 13, 1922.

STANDARDISED CHINA CLAY CO., LTD., London, E.C. Registered January 15, £4,250 debentures, part of £30,000; general charge. *£9,223. December 31, 1921.

Satisfactions

ASHFORD AND NACCOLT BRICK TILE AND POTTERIES, LTD. (late ASHFORD AND DISTRICT BRICK AND TILE CO., LTD. Satisfaction registered January 19, £5,000 registered May 13, 1921.

AYLESFORD POTTERY CO., LTD. Satisfactions registered December 18, £100, part of amount registered April 6, 1908; and £800, part of amount registered November 12, 1921; also registered December 27, £400, part of amount registered November 14, 1921.

ST. DENNIS AND PARKANDILLICK CHINA CLAY CO., LTD. Satisfaction registered February 6, £6,000, registered August 13, 1915.

VARCOE (WILLIAM) AND SONS, LTD., St. Austell, clay producers. Satisfaction registered January 23, £4,000, registered October 8, 1920.

London Gazette

Company Winding Up Voluntarily

NATELEY POTTERY, LTD. E. Furnival Jones, 4, Fenchurch Avenue, E.C.3, appointed liquidator.

The China Clay Trade Review

The Official Organ of the China Clay Industry and the only Journal specially devoted to its interests. Published in the third issue of "The Chemical Age" each month.

All Editorial communications should be addressed to the Editor, "The China Clay Trade Review," Benn Brothers, Ltd., 8, Bouverie Street, London, E.C.4. All communications relating to Advertisements, Subscriptions, and other business should be sent to the Manager, "The China Clay Trade Review," at the same address. Telegrams—"Allangas, Fleet, London." Telephone—City 9852 (6 lines).

Contents

China Clay Industry's Future

THE China Clay industry is now experiencing one of the critical periods of its history, from which it is hoped by all true well-wishers it will eventually emerge successfully. The crisis is connected with its future organisation as an association to conserve the mutual interests of the producers until trade returns to the normal. It will be seen by the report of the meeting of the producers in this issue that there are some in the trade who do not see the necessity for the perpetuation of the Association for another five years on the conditions proposed in the new agreement. On the other hand, the overwhelming majority of the producers consider this to be vital to the best interests of the entire industry and that if the Association is disbanded there will be such dislocation throughout the trade and such undisciplined competition that only the strongest firms will be able to stand against it. The inevitable result will be the monopolisation of the trade by a few firms.

It is recognised by one and all, even by the few firms who are now reluctant to continue, that in its five years the Association has justified its existence. Its value has also been impressed upon one or two firms who had previously been independent and who have now signified their intention of joining the organisation under the new conditions. The secret of its success has been that the Association from the start has countenanced none of the pernicious features of a "trust"; it has coerced no firms and has so designed its constitution that every producer retains his separate entity. The grading and priceing of clays is not arbitrarily fixed by a few big producers, but by all the producers in consultation, who base their decisions on two main factors—a reasonable return on capital and a fair living wage to their employees. The fact that few public liability companies in the trade have ever paid a dividend to their shareholders and that the few who have have rarely exceeded 5 per cent. is sufficient evidence that in protecting their interests by means of an association they have not held up the buyers and consumers of China Clay to ransom. China Clay still remains, as a prominent producer stated recently, the cheapest raw material on the market when judged by what it does.

WHY AN ASSOCIATION?

The question may be asked—why an association at all? The fact is that the China Clay industry, like the rubber industry and one or two others producing raw materials, has developed faster than the demand, which has been arrested to an abnormal extent through conditions produced by the war. The China Clay industry thus finds itself at present in the position of having a capacity for the production of 1,250,000 tons a year, whereas the world demand since 1914 has not exceeded 750,000 in a single year, and the biggest demand in a single year has never exceeded a million tons. Having regard to the restricted markets and the fact that before the Association was formed firms were being ruined by reckless price-cutting to secure those markets, the producers decided to come together in order to ensure that all should have a share of the trade that was going at a remunerative price. It is this association for mutual interests that most of the producers are anxious shall continue, the present trade conditions being what they are, and knowing what the alternative must be—a return to the suicidal pre-association position.

So far as the China Clay industry is concerned, there can never be any risk of the Association making any of the exactions of a monopoly. The excess of production over demand in the home of the British China Clay industry—Cornwall and Devon—together with the menace of competition from foreign clays in countries where British producers have big markets, will always prevent home clays from being artificially inflated. Home producers with the capacity for an output so greatly in excess of demand are not so foolish as to price their clays at a figure that is incompatible with the economic interests of the industry, because they know that the price factor is an important one in the extension of the markets for China Clay. Looked at from the economic standpoint, there can be not the slightest doubt that the interests of the industry as a whole will be best served by continuing their organisation. The alternative is too serious to contemplate. That is why we believe that the few who have been reluctant will appreciate the reasons why it is essential that they should continue in association with their colleagues in order that the Association and all it means to the industry and its dependents may not be dissolved and the whole trade thrown into a state of chaos. We believe that the level-headed business men will take the long view in the China Clay world as their colleagues have done in other industries—an attribute that must be practised in these abnormal times.

Countries of Destination

THE figures that we have recently been able to publish, showing the countries to which China Clay has been exported during the previous month and its value, we have reason to believe have been much appreciated by readers, so that it is with very real regret that we are unable to publish them this month. The officials in charge of the Government Department who have previously supplied us with these figures are unable to oblige us this month, through causes over which they have no control, but we shall be able to continue their publication next month, and so that we may have no real break in these records we shall publish both the March and April returns in our May issue.

The Chemistry of Colloidal China Clay

By Alfred B. Searle

This is the second instalment of the series of articles commenced in our issue of last month, dealing with colloidal clay in general and colloidal China Clay in particular.

THE study of the plasticity of clay is further complicated by the fact that when clay is dried it forms a comparatively hard and coherent mass, and when heated to a temperature above 700° C. it becomes even more stony in character. This degree of permanence in the dried or heated product is essential to the practical usefulness of clay, and a mixture—such as sand and water—which is plastic when wet but falls to pieces when dried is of no use as a substitute for clay. To provide sufficient strength in the dried or heated plastic material it is necessary that there should be present in it some substance which will act as a cement or binding agent, quite apart from the surface tension of the water or the very dilute solutions present in moist clay. Gelatin in small proportion will serve the desired purpose so far as dried clay is concerned, but as it burns away when the material is heated to redness, neither it nor any organic substance can be the essential bond in clays.

The actual cementing agent has never been isolated, but the experimental evidence of its existence and of its gelatinous character is fairly strong. In all probability it is a colloidal jelly which forms a coating around the particles of clay, and is composed of silicic acid, aluminium hydroxide or possibly an aluminiosilicic acid or limonite. Such a jelly would, under favourable conditions, absorb water and so produce a much thicker film of jelly around each particle. This film, if it contained sufficient water, would behave very much like a fluid and also have marked plastic properties. Being a jelly it would impart noticeably colloidal properties to the clay containing it, and a mass composed of small inert particles each surrounded by an aqueous, inorganic jelly would possess the chief properties of a plastic clay.

It would shrink and harden when dried, just as glue shrinks; it would be capable of being moulded and of being shaped by pressure; it could be built up, piece by piece, like a model made of clay, and it would have definite tensile and crushing strengths. The dried material would probably soften and expand when wetted, though it is doubtful whether it could be relied upon to fall to pieces in still water, like clay, unless some suitable acid or base were present.

The possible effect of such a substance on the plasticity of clay has yet to be investigated, and until this is done it is impossible to explain why China Clay is so much less plastic than the ball clays of similar composition which occur within a relatively few miles. No clay is ever quite pure, and their powerful absorbing action prevents them from being freed from minute proportions of acids and salts, so that chemical analyses do not explain the difference in plasticities of clays of similar composition.

It is a well-known fact that the plasticity of China Clay can be greatly increased by storing it in a wet, pasty state in cool cellars for several years, though no means are known for making it as plastic as some other clays. The chief substance produced during the storage is a complex acid and a mixture of acids which appears to be produced by the decomposition of the organic matter which occurs to a very small extent in the clay. A ball clay with a content of carbonaceous matter equivalent to 4 per cent. of carbon develops a measurable quantity of organic acid if stored for a few months, and in this time the plasticity of the clay is notably increased. China Clay contains much less organic matter and the effect of what little is present cannot be ascertained. Attempts to incorporate humic acid, and various substances which would produce it when exposed to a wet atmosphere, into China Clay have not appreciably increased its plasticity.

The addition of small quantities of various organic and inorganic acids has a doubtful effect on the plasticity of China Clay, but some potters of an earlier day used to employ stale wine in place of some of the water they mixed with the clay and claimed thereby to have increased its plasticity.

The increasing of the plasticity of China Clay appears to be largely a problem of a colloidal nature, though its nature is not yet sufficiently well understood for any practicable method to be deduced.

It appears to be connected with the size of the particles (which are larger than those in many more plastic clays) with the nature and amount of the colloidal organic matter present and with the acid or acids produced when the wet clay is stored for a sufficient length of time. The addition of dilute organic or mineral acids does not appreciably increase the plasticity of China Clay, but the addition of a very small proportion of alkali destroys it and converts the clay paste into a liquid. On adding sufficient acid to neutralise the alkali the original plasticity is restored to the clay, but the addition of an excess of acid effects no further increase.

No dry clay is actively plastic, but only potentially so; it becomes plastic when mixed with a suitable proportion of water. If too little water is used, much of the clay will remain in a non-plastic or inert state; if a moderate excess of water is added the clay will be sticky, like grease, whilst if a large excess is added it will form a liquid "cream" or slip. The proportion of water which can be present in a clay having the maximum plasticity varies with each clay, but usually averages about 20 per cent. of the plastic mass. The fact that a considerable variation in the quantity of water is permissible is another characteristic of many colloidal substances, as will be explained in a later section dealing with jellies.

IV.

Preparation of Colloidal Clay

All active colloids must usually be prepared in the form of what is commonly known as a "colloidal solution" or *sol*, which may afterwards be converted into a colloidal jelly or *gel* if required. In the present chapter only the preparation of clay sols will be considered.

All the methods hitherto used for making sols may be arranged in two groups: (1) Condensation methods and (2) dispersion methods. The condensation methods are not applicable to China Clay because no definite compound of clay is known, nor has any method for the synthesis of clay been discovered. Consequently the only methods at present available for the production of colloidal clay are those known as "dispersion methods." In each of these methods a mass of clay is separated into its constituent particles, which are distributed through water or other disperse medium in such a manner that the distributed particles, or dispersed phase, remain permanently in suspension.

Five general dispersion methods are available, each of which may be subdivided in various ways.

1. *The addition of a peptising agent* is the most important method used in the preparation of colloidal China Clay. It consists essentially in adding to the clay and water a small proportion of some substance—usually one which is soluble in water, producing a solution which is a good conductor of electricity, *i.e.*, an electrolyte—which will cause the particles of clay, when aided by mechanical stirring, to distribute themselves uniformly through the solution. This process is known as *peptisation* from its analogy to the digestive processes in the animal organism, which are induced by certain ferments which produce peptones.

Many substances may be used as peptising agents for clay, though some are naturally easier to use and more efficient than others. They must all consist of an alkali or of compounds which produce an alkali or its equivalent when dissolved in a relatively large volume of water. Such dilute solutions of salts undergo hydrolysis—*i.e.*, they are decomposed into their constituent ions—and a substance of high adsorbing power, such as clay, may remove one group of ions from the solution, as previously explained in the section on "adsorption." Indeed, the peptisation of any substance is usually the result of the effect of the peptising agent on a substance which has previously been adsorbed.

Theories as to the cause and procedure of peptisation have been propounded by several investigators; the one which appears best to explain the peptisation of China Clay is that of Freundlich, to the effect that adsorption always lowers the surface tension and consequently tends to allow the particles in a mass to become separated. If this is correct, the peptisation of China Clay by very dilute solutions of alkali, sodium silicate, or other salts is due to the adsorption of the metallic ion by the mass of clay, the surface tension of which is then reduced sufficiently for the particles to escape and to be distributed through the liquid by the violent stirring which is usually an essential accompanimnnt of peptisation.

Almost any substance which will lower the surface tension of the mass of clay will serve as a peptising agent, so that it is possible to use—

(i.) A liquid such as water. Water is so readily decomposed (hydrolysed) into what may be regarded as acid and basic ions that it acts as a powerful peptising agent, though its action is greatly increased by the addition of a little acid or alkali as may be required. In peptising clay a little alkali (such as ammonia, soda, etc.) is used, as acids have an effect on clay which is the opposite to that of peptisation.

(ii.) A non-electrolyte such as many organic liquids.

(iii.) An ion such as is produced by the dilution of some solutions of salts and other soluble substances, two groups of ions being formed, one of which can be adsorbed by the clay. Sodium carbonate, for example, splits up when in a sufficiently dilute solution into sodium ions and CO_3 ions; the sodium ions are at once adsorbed by the clay, whose surface tension is thereby lowered, thus liberating the particles of clay ready for dispersion by the mechanical process of stirring or by the slower process of diffusion. Sodium hydrate behaves in a corresponding manner and is, in some cases, even more effective.

(iv.) A salt which is decomposed into its constituent ions as just described.

(v.) A peptised colloid, the particles of which bear the same electric charge as the clay or other substance to be dispersed.

(vi.) A mixture of two or more peptising agents, such as a mixture of sodium carbonate and silicate (water-glass).

In the case of materials which are not pure, it is sometimes necessary to convert any interfering impurities into an insoluble or inert form before commencing the peptisation. Thus any soluble sulphates present should be precipitated by the addition of barium hydroxide. The latter has the advantage of being alkaline and so is a peptising agent for clay.

Numerous patents have been granted for the use of certain specified peptising agents such as "sodium sesquicarbonate," sodium phosphate, etc., but as the general principle of the kind of substances which will effect the peptisation of clay has been known for some years, there is no necessity to adhere to any one of the many materials available, except in so far as it is more convenient than the others.

The amount of peptising agent required depends upon the clay and must be found by trial. It is in all cases a very small percentage of the total weight of the clay; usually less than 1 lb. of agent per ton of clay.

2. *Mechanical disintegration* is equally effective in the peptisation of clay, but the power required is much greater than when a suitable peptising agent is present. The mechanical disintegration usually takes the form of very fine grinding and the separation of the finest and smallest particles from the remainder by some process of "washing" or elutriation. The grinding is usualy effected in the presence of water, because this prevents the escape of dust and also because water is in itself a peptising agent. Plausen's "colloidal mill" and Follows and Bates' "circular mill" are modified disintegrators which are run at an exceptionally high speed, the liquid being continuously re-circulated through the machine until a sufficient disintegration of the mass has been effected.

It is, of course, easy to combine mechanical disintegration with the use of a peptising agent; the stirring of the clay water and added salt, etc., is a crude form of such an action.

The effect of the heat produced in the stirring or grinding should not be overlooked; it may bring about a partial reversal of precipitation of the peptised product. This is probably the reason why some "colloidal solutions" of China Clay, prepared by grinding the clay in pure water and separating the liquid from all particles which can be retained on a filter paper, become cloudy on prolonged boiling.

3. *The removal of an agglomerating agent* from a colloidal substance will often effect its peptisation and conversion into a sol. Thus, some clays which contain humus derived from decomposed vegetable matter produce sols of an entirely different character if the humus is destroyed by sulphuric acid or ammonia, or if it is removed by washing the clay with water. This process is of very limited application.

4. *The electrical disintegration* of a material by passing electric current through two electrodes made of the material is scarcely applicable to clay. It is well known, under the term "Bredig's Method," as a means of preparing metallic sols. Clays are such poor conductors of electricity that the cost of using this method for them is prohibitive.

5. *Electrochemical disintegration* is apparently inapplicable to clays. The Osmose process does not produce a colloidal sol, but separates the particles in suspension according to their electric charge. Thus, iron hydroxide being electro-positive is carried to one part of the tank, whilst the clay and silica being electro-negative are carried to another part. By regulating the density of the current a partial separation of silica and clay can also be effected.

Of all the methods theoretically available for the preparation of clay sols, it thus appears that only two are of commercial interest, viz., the use of a peptising agent and the reduction of the clay by a process of grinding. The former is so simple and requires so little power that it is obviously the best method to use. Opinions may differ as to the details of procedure and the best peptising agent to employ for any particular China Clay. Apparently, slight differences in the composition and physical properties of the crude clay make it necessary to adapt the process to each material. The general principles, are, however, quite simple; the crude clay is placed in a mixing tank with a suitable quantity of water containing the selected peptising agent, *e.g.*, sodium carbonate, in solution. The mixture is stirred vigorously until the masses of clay are broken up and a creamy slip or slurry is formed. This is run off into a tank, where it is allowed to remain stationary for several hours. During this period the greater part of the particles of mica, quartz, etc., in the clay settle to the bottom of the tank. The liquid is then run into another tank, the deposited impurities remaining in the first tank.

The suspended particles will sink at a rate which depends chiefly upon their size, but partly also on their shape, as flat plates or flakes, such as mica, do not settle so rapidly as spherical particles. The rate of settlement has been shown by Stokes to be calculable from the equation

$$V = \frac{2r^2(D-d)g}{9e}$$

where V is the constant rate of fall, in cm. per sec., r the radius of the particles in cm., D their specific gravity, d the specific gravity of the liquid, e its coefficient of viscosity, (water=1) and g the constant of gravity=981 cm. per sec. As China Clay particles have a specific gravity of 2·6 the formula can be simplified and then becomes

$$V = 348{\cdot}8\,r^2.$$

Consequently the average suspended particles of clay in a clay sol will settle at the rate of 1 in. in two years. Larger particles will, of course, settle much more rapidly and the non-colloidal or at least inactive particles will settle in the course of a few hours and the very coarsest in a few minutes, and are in this manner readily separated by settlement, as described. Any other dispersed colloidal matter present will, if a dispersion method is used, be present in the clay sol, but this is unavoidable, as the other colloid cannot be removed except by methods which are impracticable on a large scale. For all practical purposes the colloidal China Clay produced by the method described is sufficiently pure to be regarded as a "commercially pure" sol.

If desired, the clay may undergo a further period of settlement in the second tank, or it may be treated in various ways, such as in a centrifugal machine, in order to separate the coarser particles more rapidly than by sedimentation without interfering in any way with the colloidal sol. The sol may

also be treated in various ways in order to increase its concentration. For instance, it may be heated until much of the water present is removed by evaporation. Ordinary methods of filtration are useless as the colloidal particles will pass through any ordinary filter.

In removing the water, care must be taken to avoid destroying the nature of the sol and converting it into a gel or even into an inactive material. These changes will be described later. At present it must suffice to remind the reader that the liquid produced as described consists almost wholly of a China Clay sol of colloidal solution in which certain characteristic colloidal properties are developed to their fullest extent. The nature of these properties is described in the next section.

It is not proposed here to describe the precautions required to obtain the maximum yield of colloidal sol from any given specimen of China Clay. These are matters for an expert in consultation with his clients, because the clays in different areas require modifications in the method of treatment. Enough has been written, however, to show that the preparation of a colloidal clay sol is quite in accordance with the methods of preparing China Clay used in Cornwall and Devon, and that the preliminary processes employed in those counties for the separation of the sand and coarser mica would still require to be employed (though with some modifications and simplifications) in the preparation of colloidal China Clay does not involve any great departure from existing methods. Rather does it amplify these methods and enables them to obtain a much purer product and one possessing many valuable properties which are obscured or defeated by the impurities in commercial China Clay.

G. W. Railway and China Clay

Visit of Officials: Big Outlay at Fowey

It is significant of the importance attached by the G.W. Railway Co. to the China Clay industry and its further development in the near future that the officials of the company, headed by their chairman (Viscount Churchill) paid another visit of inspection to the district on March 22. The party included Mr. Felix J. C. Pole (general manager), Sir George Gibbs (late general manager of the North Eastern Railway), Sir Alexander Butterworth (late general manager of the London Underground Railways), Mr. Roger Smith (chief G.W.R. electrical engineer), Mr. P. E. Culverhouse (architect), Mr. Campfield (divisional manager), and Mr. J. R. Catherall (district goods manager). They arrived at Burngullow Station by special train, where they were joined by Mr. T. Medland Stocker and Mr. R. Martin (managing directors of English China Clays, Ltd.), and Mr. Alfred Davies (work manager), who accompanied the party on their journey to the clay areas in St. Stephens district, journeying to Nanpean by way of the High Street mineral line.

On arrival at Drinnick the party were shown over the Hendra and Hallew China Clay works of the English China Clays, Ltd., and were able to see China Clay being produced by the old and new methods—at Hallew by Cornish steam pumping and at Hendra by an electrically driven centrifugal pump. Great interest was manifested in the new gas plant recently installed at Hendra new clay work, which operates not only the hose for washing China Clay and the electric pumping gear, but also the filter presses for drying, the air compressors at the china stone quarries, and the saws at the company's saw mills. Much interest was also taken in the fact that the China Clay Co. has laid down about three-quarters of a mile of railway and uses a small petrol tractor for taking all their clay from these works down to the railhead at Quarry Close siding, thus obviating all road traffic in loading the clay.

The dries at Drinnick Mill Station were visited and the filter press seen in operation, and at about 1 p.m. the train left for Fowey for the purpose of enabling the party to inspect the No. 8 jetty which is being made at that port, and on which is being installed an electric loading apparatus capable of loading the large steamers which arrive in Fowey without having to move them when they are once given a loading berth.

An outlay, estimated to amount probably to something like £300,000, is being made by the G.W.R. Co. in this development at Fowey, and it is anticipated that the whole installation will be in operation a few months hence. A great amount of excavation has had to be made in order to give suitable foundations for this equipment, and the new jetty is in a position to provide for vessels with at least 30 ft. draught at any state of the tide.

There can be no doubt that the G.W.R. fully appreciate the great importance of speedy despatch of the large boats which continually come to Fowey to load, and are making great efforts to tackle the question in an adequate manner. The complete installation of the plant now being erected must be a tremendous advance in this direction on anything which has previously been attempted by the G.W.R. Co. Despatch in loading, combined with the splendid natural deep-water harbour which is to be found at Fowey, must certainly go far to make the port an almost ideal place for the class of boats which it is intended to cater for in connection with the China Clay trade.

G.W.R. Solicitude Appreciated

At the meeting of Associated China Clays, Ltd., at St. Austell on March 28, both Mr. Stocker and Mr. Martin gave their impressions of the visit, and referred to the keenness of the chief of the G.W.R. to serve the China Clay industry in every possible way. Mr. Stocker, referring to the visit of inspection to the new No. 8 jetty, spoke of it as the last word in loading mechanics. It having been his first visit, he expressed himself surprised not only at the extent of the works which the G.W.R. have undertaken at Fowey but at the enormous outlay that is being involved to make this up-to-date provision for coping with China Clay traffic. He referred in eulogistic terms to the keen practical interest the G.W.R. officials are taking in meeting the traffic needs of the China Clay industry, giving a special word of praise to Mr. Pole, to whose energy and propensity for getting things done he paid a very high tribute. It was expected that the new jetty would be ready for loading operations in September.

Mr. Reginald Martin endorsed Mr. Stocker's references to the visit, and added that Mr. Pole was most anxious to remove whatever delays shippers of clay now experienced in getting their clay from their works to Fowey. Mr. Martin said he pointed out to Mr. Pole that there was some delay at present through most of the clay going to Fowey having to be weighed at St. Blazey, and suggested that this hindrance might be met by weighbridges being installed in other parts of the district.

Mr. Pole indicated that he was ready to meet the needs of the China Clay producers in this respect, and invited Mr. Martin to ascertain the views of the industry as to the most suitable centres for this additional weighing equipment.

The meeting expressed its appreciation of Mr. Pole's concern and welcomed the offer of more weighbridges, which, it was agreed, would be a great boon in expediting China Clay traffic. It was suggested that one weighbridge should be fixed at Goonbarrow Junction to serve the Bugle district and one at St. Dennis Junction to serve that area.

A Cornish Conversation

A London visitor to the county of Cornwall was particularly interested in a conversation that was proceeding between a couple of men at one of the clay works which he happened to be passing through with a friend. Bill was employed on the top of those sand hills attending to the unloading of the tram wagons as they come up from the pit's bottom, and his duty was to see that the wagons were carefully attached to the wire rope to be lowered again into the pit. The lever which regulates the tram rails had broken. It was a very boisterous day and Bill had to call to Jan, who was regarded as the handy man of the works. Bill sees Jan descending the pit, and as loud as he could command his voice Bill calls first :

" Hoi, Jan ! . . . Hoi, Jan ! "

Jan, looking up in the direction of Bill's voice, replies, " Wat-ee-waant ? "

Bill : " Tha theng is brocked."

Jan : " Wat ee yay ? "

Bill : " Tha theng is brocked."

After several repetitions Bill succeeds in explaining that it was tha theng wat thay knack en gear long way. Jan eventually grasped the situation and he goes to attend to Bill's requirements.

Amongst the Cornish Clay Mines

Stannon—The World's Largest Set

(One of the many pits and works of English China Clays, Ltd.)

THE special series of articles appearing from time to time in THE CHINA CLAY TRADE REVIEW on the china clay mines of Cornwall and Devon should possess a peculiar interest to all consumers of china clay, and will perhaps give them a better idea of where their clays are obtained and how the raw material is treated and handled before it reaches them.

STANNON PIT, SHOWING CORNISH MOUNTAINS IN BACKGROUND

Stannon Moor possesses the largest "set" or china clay deposit in the world, and is situated in the parish of St. Breward, Cornwall. The huge pit lies under the shadow of Cornwall's second loftiest ridge, known as "Rough Tor," 1,296 ft. above the level of the sea. Thirty-two years ago negotiations for the right to prospect for china clay took place with the lord of the manor—Sir William Onslow—and eventually a company, with which several famous medical men from Harley Street were connected, was formed to work the ground. Several years elapsed before the mine reached a productive stage, as the foundations were laid for great operations, hitherto unknown in the china clay industry. The production of clay did not seem to relieve the original company from serious commercial embarrassment, and it was not until 1911, when Mr. Walter Sessions undertook control, that a new era of prosperity for those associated with the mine at last commenced.

The operations at the kilns, and also in connection with the loading of all shipments, are quite distinct from the operations at the Stannon Pit, but the private telephone keeps them in

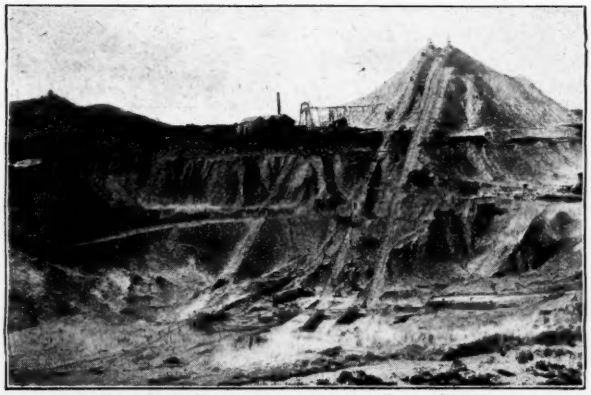
THE EXTENSIVE REFINING FLOORS AND SETTLING PITS

close touch with all parts of the works, and also with the head office.

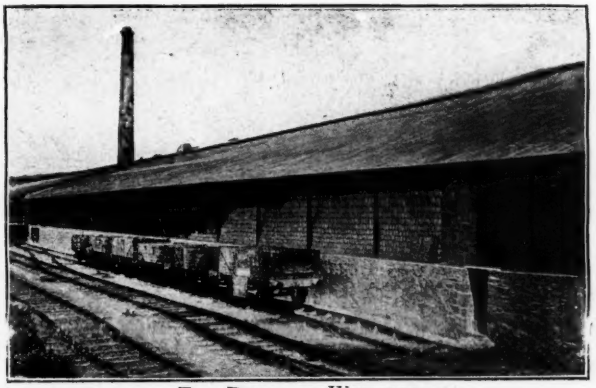
The Stannon Pit has employed a large number of hands during the last twenty years, and for many years past the hydraulic hose has played an important part at this mine. With a copious supply of spring water, there seems to be no difficulty in thoroughly separating the clay from the quartz sand. The clay water passes on to the pumping culvert, whilst the waste sand is allowed to settle in a rather ingeniously arranged series of sand boxes, which are filled up in succession. The waste sand, which is loaded into train wagons and drawn up to the top of the pit on a double incline railway, forms those gigantic sandhills which are a peculiar feature of many Cornish landscapes. A load of this sand is drawn to the surface on each line every three minutes.

The power station of the Stannon Pit is designed and equipped with two gas engines of 175 h.p. each. One engine only is sufficient for the work, but the installation of the two ensures continuity of supply. In the winding section of the power house ultra-modern methods have displaced the older ones. The loaded tramways can now be located in the power house, as each ascends or descends the pit. The pumping plant has many advantages in the reduction of working costs. Distinguished visitors from all parts of the world have congratulated the management on their methods of production.

It will be remembered that this mine was one which was absorbed a few years ago by English China Clays, Ltd., St. Austell, and Mr. Sessions then became one of the three managing directors. English China Clays, Ltd., comprising as it does three of the largest firms in the trade, are undoubtedly capable of revolutionising the industry. The unity of control of such an organisation, controlling over twenty of the largest mines in the district, with their unequalled distributing facilities, easily place them in the front rank of producers of china clay.



STANNON PIT, SHOWING THE SAND DUMPS



THE DRIES AT WENFORD

China Clay Notes and News

G.W.R. and Clays

In his monthly review of traffic on the G.W.R., Mr. Felix J. C. Pole, general manager, in the statistics dealing with commodities originating on the G.W.R., gives the following figures with reference to clay, including China Clay from Devon and Cornwall and ball clay from Devon and Dorset: November, 1922, 78,386 tons; December, 1922, 70,483 tons; January, 1923, 82,645 tons, against 54,305 tons in January, 1922.

China Clay Industry and the Rates

As evidence of the effect the China Clay industry has on the rates in the Cornwall China Clay areas, it was acknowledged at the meetings of the St. Austell Rural District Council and Guardians that in consequence of the increased assessable value as a result of the revival in the China Clay trade last year, it was possible to make still further reductions in the rates, despite their heavy commitments on unemployment relief schemes entered into during the year. It was explained that the reduction amounted to 3d. in the pound, compared with the last half-year, and 10d. on the previous half-year, in spite of the fact that the demand for the County rate has been increased by 3½d. in the pound.

FRESH DISCOVERY OF CHINA CLAY IN CORNWALL (*See par. on page 15*)

Civil Servant's Retirement

Mr. Andrew Peters, elder son of the late Mr. Woodman Peters who was one of the founders of the firm of Parkyn & Peters, the well-known China Clay merchants, has retired from the Civil Service after many years on the Board of Education, having attained the age of 60.

On his retirement he was presented by his colleagues with a handsome illuminated address, together with a very ornate library timepiece. The presentation was made in the Victoria and Albert Museum, with which Mr. Peters had been connected for over thirty years. Mr. Peters, like other members of the family, retains a material interest in the China Clay industry in connection with the firm of Parkyn & Peters.

More Research into Colloidal Clay

The enterprising firm of H. D. Pochin and Co., Ltd., are not behind in the matter of the manufacture of colloidal china clay and for some years have made a study of this interesting subject. Three years ago active investigations were set on foot, and arrangements made whereby Mr. Arthur Rigby—now on the staff of this company, but at that time under Dr. Mellor, of the Central School of Science and Technology, Stoke-on-Trent—should devote his whole time to investigating the methods of preparing china clay in the colloidal state. The results of other investigators were carefully examined, and the application of their methods to the firm's clays tested. The methods of preparation which came up for inspection included both the chemical and the electro-chemical processes. Many workers have reported on the former, but it was left to Count Schwerin and his staff to develop the latter on a practical basis.

The researches by Mr. Rigby were employed in the most favourable directions, with the result that later investigations were carried from the laboratory to the mines. Several modifications of the method adopted were necessitated by practical considerations, but eventually the firm were able to produce china clay in a highly colloidal state and on a reasonable economical basis. They have for some time past been supplying colloidal clay for special purposes, and have made arrangements whereby they can considerably increase their output at very short notice, and so are quite prepared for the time when the research work in hand has opened new markets. It has, however, always been recognised that the cost of producing colloidal clay would prohibit its use in some directions. Furthermore, in some industries the presence of a large proportion of Sol clay has been found deleterious to the use of china clay. We may add that the firm will be glad to send Mr. Rigby, who, as already stated, has made a special study of colloidal clay, to consult with any firm interested in this material.

Clay Drying at Par

The harbour end of Par Moor is becoming an important centre for the drying of china clay which has been piped from the pits further inland. All the existing kilns are busy, while another large one is approaching completion. This kiln will be equipped with up-to-date facilities for the quick loading and despatch of cargoes. Another recent and important development at one of the Par kilns is the substitution of an oil-burning plant in place of coal fires for drying the clay. It is claimed that the oil is much more economical, and a "pan" of clay can be well dried in a far shorter period.

Will Canada be Centre of Paper Industry?

The statement credited to Don Seitz of the *New York World*, that a number of the paper mills in the United States should be removed to Canada, where a more ample supply of pulpwood may be obtained as well as an abundance of cheaper water-power, has attracted attention in Ottawa. It is considered only a matter of time until a number of them move northward, for the foregoing factors are sure to determine very largely where the centre of the pulp and paper industry on this continent is to be located.

A U. S. Patent for Sizing Paper

Loaded paper stock is sized by treating the filling material while in suspension in water with a dilute colloidal aqueous solution of a free rosin size. The materials are mixed until physical actions take place which indicate that the proper mixing has been obtained. The size is then added to the paper stock in the beating engine.

Discovery of China Clay at St. Ives

On the opposite page we publish a photograph of a new china clay works at St. Ives. It is so customary to associate china clay with the districts of St. Austell, St. Dennis and St. Stephens, that it is surprising to find china clay has recently been discovered in the western part of the country in the neighbourhood of St. Ives, between Halsetown and Towednack on the estate of Lady Hain. It was long thought by Mr. S. H. Stevens, Lady Hain's steward, that china clay existed in that district, and experimental borings carried on by that gentleman resulted in his serious attention being given to the matter. After some weeks of laborious borings and geological examination, a fine bed of clay was located. It is anticipated that there is an area of at least 20 acres and experiments have shown that it reaches to a depth of 60 ft. It was decided to at once proceed with the erection of powerhouses and plant, pits and drys for developing the enterprise. The photo shows the first pit from which extraction will be made and which at present is having the top surface removed and carried up to dumps and embankments.

China Clay Producers

The Future of the Association

ALL those associated with the China Clay industry are well aware that since January, 1918, the mutual interests of the producers have been safeguarded through an association known as the Associated China Clays, Ltd. This Association, while leaving individual firms their independence in the carrying on of their individual works, has by means of an agreement to which practically all engaged in the industry have subscribed, conserved the interests of the industry as a whole. In the course of the experience gained in the working of the Association certain modifications have had to be made to meet new contingencies, to which all the members have been parties.

Terms of Proposed New Agreement

In consequence of a new situation, arising from the fact that last year's trade was the nearest approach to the pre-war volume, the majority of the producers decided that this new situation would be best met by a new agreement incorporating new conditions and most of the conditions of the old, and extending the life of the Association from 1925 to the end of 1927. The need for this has been stated by the producers in the following terms :—

" It is probable that the demand for China Clay may not reach a normal level for several years, during which there is great danger that many employees of China Clay undertakings will lack employment, and many of the works will be left idle and may possibly become derelict unless measures extending over a period of five years at least from January 1, 1923, are taken to ensure that as much clay as possible shall be produced and at a fair and proper price. It is apprehended that these presents (the new agreement), while made primarily for the benefit of the producer, are nevertheless also for the benefit of the landowners and workers and the public at large."

All organisations connected with the industry, namely, The China Clay Owners' Federation, The China Clay Employers' Federation, and the Workers' Union, having realised the advantages of the Association to the industry as a whole, have signified their opinion of the value of the Association and their conviction that it should be continued.

There are, however, a few producers who have shown some reluctance to subscribe to the new agreement, the effect of which has been to cause a great deal of concern in the China Clay areas lest, by their abstention, the Association should be disbanded and the China Clay industry be thrown back, to the undesirable conditions prevailing before it was formed. So acute did the crisis become that unusual interest was manifested in a very largely attended meeting of the producers which took place at St. Austell on March 28, at which it was thought that the fate of the Association would have to be decided. It was generally felt that a hasty decision would be so serious for the industry that ultimately the meeting decided to postpone their final decision on the question of the future of the Association until the beginning of May, in order that firms still holding out may be given an opportunity to signify their intention of signing the new agreement with their old colleagues.

Views of Trade Leaders

At the meeting referred to, at which 90 per cent. of the trade was represented, the Hon. H. D. McLaren presided, supported by Mr. R. Martin (vice-chairman), and Messrs. T. Medland Stocker, J. W. Higman and J. S. Lovering (managing directors).

The Secretary (Mr. Samuel Benson) reported that there were still a few firms who had not definitely signified their intention of signing the agreement. While some of them admitted the value and usefulness of the Association, they desired some modification of the terms of the new agreement to apply in their cases as a condition to their signing.

The Chairman moved the various resolutions intended to make the new agreement operative as from January 1. On being put, it was carried by a show of hands, none dissenting. The effect of the passing of these is that the Association goes on under the new conditions until the end of 1927, unless it transpires that at the next meeting such important firms are still outside as will materially militate against the interests of the Association. In that case the producers will consider the winding up of the Association and throw the whole industry into the melting-pot.

In the course of the discussion Mr. Walter Sessions, supporting Mr. Stocker's suggestion that the Secretary be instructed to call a meeting at some future date, said he would like to convey from that meeting, to those who had not signed, the terrible responsibility that would fall upon their shoulders supposing by their action they broke the Association. It seemed to him that some of these people did not realise what such action would bring on the whole clay industry. It was not only gambling in finance, but also in the wellfare and life and death of the people in the district, and he would like the fact to be impressed upon them.

The Chairman said there seemed to be a general inclination to continue the Association under the new rules and also to adopt Mr. Stocker's suggestion to call a general meeting of the Association at an early date to consider whether the support was sufficient to warrant them to carry on. Their Board meeting would be held after Easter and they would formally call a meeting of the Association in the first week in May.—This course was unanimously agreed to.

China Clay Man Returns to U.S.A.

ENLARGING their loading facilities at Fowey, England, the Association of China Clay Companies which includes most of the operating pits of England, will be able to expedite shipments of clay in the future. The new jetty will be completed some time this summer, according to Henderson Inches, of the John Richardson Company, who returned last week on the *Baltic* from a visit to the other side. It will increase the loading capacity of the port of Fowey by 1,500 tons per day, although this will not be apparent immediately, according to Mr. Inches, because of repair work that will start on the old jetty when the new one is in shape for operations. Information which Mr. Inches obtained while abroad confirms the impression that the quotations that were named by the English producers as of January 1 will hold for the twelve months of 1923. The importer also reports that the above-mentioned association of clay producers which was formed originally for a seven-year period which would come to an end this year has been continued for a five-year period.

Industrial and Trade Reports

(From our Own Correspondents and Other Sources)

Great Britain

The British Paper Trade.

In British paper circles we have our own troubles, but they are so restricted that they have not the virtue of conferring the same reflex benefit upon the industry as a whole. From the determination which characterises the disputes on both sides, it is evident that great importance is attached to the point at issue. Valleyfield is an instance. Here a large paper mill has been closed for ten weeks or more over one man. Serious financial loss must have been suffered already, both by the owners of the mill and the unions supporting the workpeople. There is surely something hidden below the surface that accounts for the prolongation of the dispute ; and it seems unfortunate that a solution could not long ago have been reached. Other labour quarrels are also in being, resulting in loss and inconvenience beyond the circle of those immediately concerned. These include Samuel Jones and the De La Rue affairs, the latter of which has spread to H.M. Stationery Office. It is only to be expected, we suppose, that parties to a dispute should adopt every measure that will advance their cause. In doing so, however, they involve perfectly innocent persons. The great danger at the moment is the sympathetic strike. In the case of the Stationery Office, the only grievance is that members of the National Union of Printing Bookbinding and Paper Workers would not handle goods intended for De La Rue, and the trouble has spread so that many of the Stationery Office publications are held up. This far-reaching effect, of course, just suits the book of the union leaders, but it interferes with the legitimate occupations of many people in diverse directions. There is a grave aspect to these labour troubles which is not apparent at first sight.—*The World's Paper Trade Review.*

English China Clay Prices.

China Clay, in bulk, f.o.b. Cornwall, 28s. 9d. to 71s. (highest grade) per ton. The extra charges (including filling) per ton for bags and casks are :—Single bags, 9s. 6d. ; double bags, 16s. 6d. ; half-ton casks, 19s. 6d. ; quarter-ton casks, 22s. 6d., in casks, with extra iron hoops, 2s. per ton more.

United States of America

Promising Outlook for Paper Sales.

A very pronounced advance in printing sales and paper purchases in the United States during December last is indicated in the chart just issued by the Department of General Service of the American Writing Paper Co. and compiled by its Commercial Research Division. A review of this chart showing the trends and fluctuations for the past three years gives substantial evidence on which to forecast a continuance of the advance during 1923. Since November, increased activity has been noticeable in the printing industry, especially in the book and job branches. Statistics based on accurate data compiled by the U.S. Bureau of Labour shows that, in the two branches mentioned, there was an increase in December over November of over 5 per cent. in numbers of employees and nearly 6 per cent. in amount of pay roll. Moreover, coupled with these facts, the general feeling and attitude prevailing in the printing trade are unmistakably optimistic. This optimism is sounded in the expressions uttered by men prominent in the printing industry that it has entered a period of sound growth and normal expansion.

American China Clay Prices.

Clay dealers during the past week maintained that business in both foreign and domestic grades of coating and filling clays was progressing at a favourable rate with all grades in very good call. Imported China Clay is in especially good demand at present. Most clay dealers believe that if there is any change in the present quotations it will be an upward one.

Available quotations follow :—

English clay, ex steamer, per ton	14.00 to 20.00
Domestic clay, washed, per ton	8.00 to 10.00
Domestic clay, unwashed—	
No. 1 per ton	6.00 to 7.00
No. 2	5.00 to 6.00

New China Clay Plant in U.S.A.

The London correspondent of *Chemical and Metallurgical Engineering* (New York), in discussing progress in the china Clay industry, states :—

The past year has witnessed a remarkable recovery in the China Clay industry, the quantity marketed representing more than 75 per cent. of the pre-war production and the export trade having been more than double that of 1921. Cornish methods of handling China Clay and refining it for the market have always appeared crude and inefficient to the uninitiated. Furthermore, some of the improved machinery installed just before the war was requisitioned by the Government. The improvement in consumption has revived interest in improved methods, but it is unlikely that economies are really practicable except as regards fuel and improved grading of the finished product. The new plant of the Standardised China Clay Co. is about to begin operations, and comprises four 36 in. Gee centrifugal separators, in which the China Clay is automatically divided into four or more grades both as to fineness and quality, the coarser product containing a higher percentage of silica and other impurities. At the same time moisture is brought down to as low as 25 per cent. in the machines, and an improved gas-heated drier leads to further economies. The high-grade material from these machines commands a considerably enhanced price, and it merely required standardisation and educational propaganda to enable an increased over-all profit to be obtained. There is also the possibility of further purifying and re-grading the inferior product from these machines. The further study of China Clay for its use in chemical manufacture as distinct from those in paper making, pottery, cotton goods and so forth, seems well worth while, as there is ample scope for widening the China Clay market.

Saskatchewan Clay Deposits

To the Editor of The China Clay Trade Review.

Sir,—As you may possibly be aware, a considerable amount of interest is now being displayed by ceramic experts in the numerous deposits of valuable clays to be found in the Province of Saskatchewan—these ranging from the lower grades used in the manufacture of bricks and tiles to a kaolin which, it is claimed, burns as white, if not whiter than the British product.

In this connection the Provincial Authorities have, through the Saskatchewan Bureau of Labour and Industries, secured the services of a fully qualified ceramic engineer, in the person of Professor W. G. Worcester, who is engaged in the compilation of data for the perusal of prospective investors. Although the investigations made up to the present are only in their initial stages, the Saskatchewan Bureau of Labour and Industries is desirous of bringing the information already compiled to the attention of British clay-workers, and has therefore sent over to the High Commissioner a bulletin on the clays of Saskatchewan which it is thought may interest parties in Great Britain likely to be willing to undertake development work in this field in Western Canada.

The article in question, with accompanying photographs, could be consulted at this office by any London representative of the parties interested who might be deputed to call for the purpose ; and I trust that it may be possible for you to make this known to clay-workers and others with whom you are in touch.—Yours, etc.,

Lucien Pacaud,
Joint Secretary.

19, Victoria Street, S.W.1.
April 11, 1923.

Italy Poorly Placed for Domestic Kaolins

English China Clays have very little to fear from the competition of Italian clays in Southern Europe. It is officially acknowledged that the kaolin industry of Italy is not well developed. Many of the deposits that are worked yield clays of only moderate quality. Better sources of supply are so remote from the manufacturing centres and the seaboard, that the cost of transport practically prohibits their employment to any great extent.

Shipping and Export News of the Month

We give below the latest particulars relating to arrivals and sailings of ships engaged in the China Clay Trade, at the principal British clay ports. Registered exports of China Clay with countries of destination, and other shipping and export matters are dealt with.

Fowey Shipping—March 1923

Arrived.		Vessel's Name.	Sailed.
Mar. 1,	S.S.	*Leaside*	Mar. 6, Antwerp
Mar. 1,	S.S.	*Pansy*	Mar. 7, Preston
Mar. 2,	S.S.	*Fylla*	Mar. 7, Seville
Mar. 2,		*My Lady*	Mar. 2, Par
Mar. 2,	S.S.	*Kylebute*	Mar. 7, Hull
Mar. 3,	S.S.	*Parracombe*	Mar. 8, Rochefort
Mar. 3,		*Western Lass*	Mar. 13, Glasgow
Mar. 3,	S.S.	*Freeland*	Mar. 6, Birkenhead
Mar. 5,	M.V.	*Ingeborg*	Mar. 8, Karlskrona
Mar. 5,		*Lizzie Trenberth*	Mar. 7, Runcorn
Mar. 5,		*Olive Branch*	Mar. 19, Weston Point
Mar. 5,	S.S.	*Pickmere*	Mar. 8, Birkenhead
Mar. 5,	S.S.	*T. W. Stuart*	Mar. 8, Gravesend
Mar. 6,	S.S.	*Moss Rose*	Mar. 9, Glasson Dock
Mar. 6,	S.S.	*Embleton*	Mar. 10, Rouen
Mar. 7,	M.V.	*Agathe*	Mar. 13, Gothenburg
Mar. 7,	S.S.	*Mango*	Mar. 9, Weston Point
Mar. 8,	S.S.	*Glenrose*	Mar. 10, Newcastle
Mar. 9,	S.S.	*Brier Rose*	Mar. 10, Preston
Mar. 9,	S.S.	*Tyrifjell*	Mar. 13, Skien
Mar. 9,		*Zampa*	Mar. 17, Looe
Mar. 10,	S.S.	*Mersey*	Mar. 13, Preston
Mar. 10,		*Saarlaid*	Mar. 21, Bo'ness
Mar. 10,	S.S.	*Aegir*	Mar. 12, Rochester
Mar 10,		*C. V. Petersen*	Mar. 16, Leith
Mar. 10,	S.S.	*Dempster*	Mar. 14, Antwerp
Mar. 11,	S.S.	*Redbreast*	Mar. 14, Birkenhead
Mar. 11,	M.V.	*Isabel*	Mar. 13, Falmouth
Mar. 11,		*Mary Ann*	Mar. 13, Charlestown
Mar. 12,	S.S.	*Merwestroom*	Mar. 16, Amsterdam
Mar. 12,	S.S.	*Isabella*	Mar. 15, Par
Mar. 12,		*Regina*	Mar. 15, Par
Mar. 12,	S.S.	*Marnix*	Mar. 15, Passages
Mar. 12,		*N. P. Petersen*	Mar. 21, Odense
Mar. 13,	S.S.	*Falmouth Castle*	Mar. 14, Runcorn
Mar. 13,	S.S.	*Broadgreen*	Mar. 17, Brussels
Mar. 13,	S.S.	*Westdale*	Mar. 16, Ridham
Mar. 14,	S.S.	*Ratipiko*	Mar. 16, Gravesend
Mar. 14,		*Hilda*	Mar. 31, Antwerp
Mar. 14,	S.S.	*Elswick Tower*	Mar. 22, Portland, Me.
Mar. 14,	S.S.	*Magrix*	Mar. 17, Gravesend
Mar. 14,	S S	*Mellanear*	Mar. 17, Grimsby
Mar. 15,	M.V.	*Olive May*	Mar. 15, Charlestown
Mar. 16,		*Frem*	Mar. 19, Charlestown
Mar. 17,	M V.	*Noordkap*	Mar. 22, Grimsby
Mar. 17,	S.S.	*King City*	Mar. 24, Boston, U.S.A.
Mar. 18,	S.	*Devon Coast*	Mar. 20, Birkenhead
Mar. 18,	M.V.	*Fides*	Mar. 22, Bo'ness
Mar. 19,	S.S.	*Brier Rose*	Mar. 22, Larne
Mar. 19,		*Madeleine*	Mar. 29, Nantes
Mar. 20,	S.S.	*Wearbridge*	Apr. 1, Philadelphia
Mar. 20,	S.S.	*Oxbird*	Mar. 23, Gravesend
Mar. 20,	S.S.	*Falmouth Castle*	Mar. 23, Weston Point
Mar. 21,	S.S	*Moss Rose*	Mar 23, Preston
Mar. 21,	S.S.	*Pansy*	Mar. 23, Preston
Mar. 21,	S.S.	*B. W. III*	Mar. 26, Antwerp
Mar. 21,		*Conrad Ludhring*	Mar. 23, Plymouth
Mar. 21,	S.S.	*Cliffmore*	Mar. 26, Antwerp
Mar. 21,	S.S.	*Robrix*	Mar. 24, London
Mar. 22,	S.S.	*Main*	Mar. 27, Rouen
Mar. 22,	M.V.	*Isabel*	Mar. 23, Plymouth
Mar. 22,		*Adelaide*	Apr. 6, Runcorn
Mar. 22,		*J. M Neilsen*	Apr. 6, Kirkcaldy
Mar. 22,	S S.	*Compass*	Mar. 27, Brussels
Mar. 23,	M.V.	*Greitje*	Mar. 29, Leith
Mar. 23,	S.S.	*Falconer*	Mar. 28, Antwerp
Mar. 24,	S.S.	*Glenbrook*	Mar. 27, Gravesend
Mar. 24,	S.S.	*Seaforth*	Mar. 25, Newlyn
Mar. 24,	S.S.	*St. Levan*	Mar. 26, Porthoustock
Mar. 25,	S.S.	*Nor*	Apr. 4, Drammen
Mar. 26,	S.S.	*Kifuku Maru*	x
Mar. 26,	S.S.	*Alness*	x
Mar. 26,	M.V.	*Fruhling*	Mar. 29, Hamburg
Mar. 28,	S.S.	*Primrose*	Apr. 4, Preston
Mar. 28,		*My Lady*	Mar. 31, Par
Mar. 28,	S.S.	*Mersey*	Apr. 3, Preston
Mar. 29,	S.S.	*Rytoner*	Apr. 4, Antwerp
Mar. 30,		*Roscovite*	x
Mar. 30,		*Raymond*	x
Mar. 31,		*Zampa*	x

x in Port.

Par Harbour Shipping—March, 1923

Arrivals

Date.		Vessel's Name.	From
March 1	S.S.	*Trader*	Hull
March 2		*My Lady*	Looe
March 4		*Amy*	Port Mairs
March 9	M.V.	*Sarah Colebrooke*	Plymouth
March 10		*Naiad*	Truro
March 14		*Regina*	Cowes (I.O.W.)
March 14		*Snowflake*	Runcorn
March 15	S.S.	*Isabella*	Fowey
March 16	S.S.	*Admiral*	Plymouth
March 19		*Martinet*	Plymouth
March 20	S.S.	*Robrix*	Hull
March 20		*Daisy*	Truro
March 21	S.S.	*Iron Duke*	Sharpness
March 22		*Pedestrian*	Looe
March 23	S.S.	*Glenbrooke*	Chichester
March 23		*Alice Williams*	Penzance
March 24		*Winifred*	Port Houstock
March 24		*Ingrid*	Port Levan
March 30		*Rosina*	Sheerness
March 31		*My Lady*	Rochester
March 31		*Rhoda Mary*	Runcorn

Sailings

Date.		Vessel's Name.	From.
March 3	M.V.	*Camborne*	Gloucester
March 3		*La Revanche Hensbout*	Nantes
March 5		*Lizzie Trenbert*	Runcorn
March 6		*Lady Agnes*	Greenhithe
March 7		*Two Sisters*	Antwerp
March 6	S.S.	*Trader*	Antwerp
March 7		*My Lady*	London
March 7		*Amy*	Irvine
March 15	S.S.	*Isabella*	Antwerp
March 18		*Naiad*	Antwerp
March 20	M.V.	*Sarah Colebrooke*	London
March 21	S.S.	*Robrix*	Fowey
March 22		*Regina*	Mevagissey
March 23	S.S.	*Iron Duke*	Penarth
March 24	S.S.	*Glenbrooke*	Fowey
March 29		*Winifred*	Plymouth
March 31		*Martinet*	Antwerp
March 31		*Daisy*	Poole
March 31		*Ingrid*	Dundee

Charlestown Shipping

Arrivals

Date.	Name of Vessel.		From.
March 1		*Rylands*	Cardiff
March 4	S.S.	*Halton*	Calais
March 4	S.S.	*Isabel*	Plymouth
March 9		*Leonard Piper*	Exeter
March 10		*Lady Rosebery*	Torquay
March 13		*Mary Ann*	Fowey
March 14	S.S.	*Fox*	Exeter
March 14	S.S.	*Christania*	Penrhyn
March 15	M.V.	*Olive May*	Plymouth
March 19		*Trim*	Dover
March 20	S.S.	*Rosegraph*	Plymouth
March 21		*Jane Slade*	Penzance
March 25		*St. Paul*	Nantes
March 29		*Hetty*	—
March 30	S.S.	*Alison*	Barry
March 30		*Amy*	Irvine
March 31		*Katie*	Fowey

Sailings

Date.	Name of Vessel.		Destination.
March 1	S.S.	*Falmouth Castle*	Manchester
March 2		*Western Lass*	Fowey
March 3		*St. Paul*	Nantes
March 5	S S.	*Halton*	Ridham
March 8		*Amanda*	Preston
March 8	S.S.	*Isabel*	Plymouth
March 13		*Leonard Piper*	Rochester
March 15	S.S.	*Fox*	Brussels
March 15	S.S.	*Christania*	Barrow
March 20		*Mary Ann*	Northfleet
March 20		*Rylands*	Greenhithe

Sailings—*continued*

Date.	Name of Vessel.	Destination.
March 21.....	M.V. *Olive May*	Dartford
March 21.....	*Lady Rosebery*	Rochester
March 22.....	S.S. *Rosegraph*	Liverpool
March 23.....	*Jane Slade*	Antwerp
March 31.....	*St. Paul*	Nantes
March 31.....	*Duchess*	Runcorn

China Clay Deliveries

First Three Months better than 1922

FOLLOWING a slack time early in March—mainly due to the disturbance in the freight market consequent upon the demand for coal cargoes for the Continent—the China Clay trade was to a large extent retrieved in the latter part of the month. Being a three days longer month, March would have capped the 60,954 tons done in February if things had been normal; as it was it fell 600 tons short. The tonnage shipped for the three months this year has reached 195,610 tons, against 157,265 tons for the corresponding three months last year, an excess of 38,345 tons. The detailed figures for March are :—

Fowey	48,764 tons
Charlestown	3,425 ,,
Par	2,689 ,,
Plymouth	832 ,,
Falmouth	31 ,,
Penzance	1,080 ,,
By rail	4,631 ,,
Total	61,452 ,,

against 60,189 tons in March, 1922.

Fowey China Clay Shipments Reviving

FOLLOWING a slump in shipping at the end of February and the beginning of March at the port of Fowey, in consequence of disturbances in the freight markets through the heavy demand for coal cargoes from the Continent, China Clay shipments to America are being resumed on a fairly large scale. During March the following were the chief cargoes loaded for American ports: Steamships *Yeifuku Maru*, Japanese, 6,500 tons, to Philadelphia; British, *Elswick Tower*, 5,300 tons, to Portland, Maine; British, *King City*, 4,000 tons, to Boston, Mass.; British, *Wearbridge*, 6,500 tons, to Philadelphia. Sixty-five coasting vessels and steamers were also dealt with. The Dutch vessel, the *Merwestroom*, also loaded 18,000 tons for Amsterdam.

Since March business at the port has become brisk. The Japanese steamship, the *Keifuku Maru*, has loaded 6,500 tons, and the British *Alnass* 5,500 tons, both for America.

Developing Fowey as a Port

THE *Western Morning News* says compared with tonnage of china clay shipped from Fowey, that from other ports and by rail direct to destinations is very small. During last month 48,764 tons were shipped from Fowey, and about 9,000 from other ports and by rail, making the total for March approximately 58,000 tons. This compares with March last year of 60,189 tons. Taking the three months, 1923 is well ahead of last year, good as that was, the aggregate figures being 193,238 tons, against 157,265 tons, showing nearly 36,000 tons to the good. The inflation of the freight market through the demand for coal cargoes on the Continent arising out of the Ruhr situation had a depressing effect on shipping at Fowey at the end of February and during the greater part of March, and accounts for the falling off from the brisk trade earlier in the year. Now that the freight market has become more settled there is a revival of shipments to America. On the Continent the china clay trade is still suffering from the fall in the exchanges consequent upon the action over reparations, the biggest demand being confined to the cheapest clays. Considerable satisfaction is felt throughout the china clay trade for the practical effect the Great Western Railway and their chief officials are giving to the needs of the industry. The activity and keenness displayed by the general manager (Mr. Felix J. C. Pole) is particularly appreciated, and was referred to in praiseworthy terms at a recent meeting of the china clay producers. Twice recently Viscount Churchill (the chairman), Mr. Pole, and other prominent officials have paid special visits to the china clay area and Fowey with a view to improving mineral line traffic facilities and accelerating loading operations at Fowey. It is announced that the construction of the new mechanical jetty at Fowey will be completed so that the loading of the big ocean-going steamers will be commenced in September. A feature of the provision made at this new jetty is that vessels of at least 30 ft. draught will be able to load at any state of the tide and take in their cargoes to any part of their holds without moving their positions after once in berth. It is estimated that the total outlay of the Great Western Railway on their developments at Fowey will not fall far short of £300,000. The excavations that have had to be made to provide adequate foundations for the new jetty have been extraordinary. When completed the equipment will be far in advance of anything previously in operation at Fowey, and will ensure for the big steamers a quick despatch as at bigger ports. To ease the congestion that is now experienced at St. Blazey, where most of the clay destined for Fowey is weighed, Mr. Pole has invited the china clay producers to make recommendations. They have therefore asked for the installation of extra weighbridge centres at Goonbarrow for the Bugle area, and at St. Dennis junction for St. Dennis and St. Stephens area, so that clay destined for Fowey may make the journey and avoid the present "hold up" at St. Blazey. The chief topic of discussion in china clay circles is the question of the continued existence of the Association, which is to come up for final decision at a special meeting early in May. Now that the subject has been ventilated and the true position revealed, the feeling is stronger than ever that the future prosperity of the industry is wrapped up in the continuation of the Association under the new conditions proposed, a feature of which is their equal justice to all firms.

Commercial Intelligence

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

PIRIE WYATT AND CO., LTD., Wells (Somerset), paper manufacturers.—Registered March 13, mortgage, to London Joint City and Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on St. Cuthbert's Paper Works and cottages, Wookey, with machinery, etc. *£12,000. August 16, 1922.

ASHFORD AND NACCOLT BRICK TILE AND POTTERIES, LTD. (late ASHFORD AND DISTRICT BRICK AND TILE CO., LTD.).—Registered March 19, £3,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £2,600; general charge. *£5,000. January 15, 1923.

HARTLEPOOLS PAPER MILL CO., LTD.—Registered March 26 (by order on terms), supplemental Trust Deed dated November 22, 1922, securing £50,000 additional debenture stock; charged on company's properties at West Hartlepool, also general charge (excluding uncalled capital). *£265,000. October 18, 1922.

Reduction of Capital

MANCHESTER CHINA CLAY CO., LTD.—Capital reduced to £32,700, divided into 25,000 ordinary shares of £1 each and 7,700 preference shares of £1 each instead of the original capital of £50,000 divided into 25,000 preference shares of £1 each and 25,000 ordinary shares of £1 each. At the time of registration 17,300 ordinary shares had been issued and fully paid up, and none of the preference shares had been issued.

London Gazette

Company Winding Up Voluntarily

BOVEY VALLEY CHINA CLAY CO., LTD. Francis S. Clark, of Newton Abbot, accountant, appointed liquidator.

The China Clay Trade Review

The Official Organ of the China Clay Industry and the only Journal specially devoted to its interests. Published in the third issue of "The Chemical Age" each month.

All Editorial communications should be addressed to the Editor, "The China Clay Trade Review," Benn Brothers, Ltd., 8, Bouverie Street, London, E.C.4. All communications relating to Advertisements, Subscriptions, and other business should be sent to the Manager, "The China Clay Trade Review," at the same address. Telegrams—"Allangas, Fleet, London." Telephone—City 9852 (6 lines).

Contents

Organised China Clay Industry

THE grave crisis which has threatened the China Clay industry for many months past over the question as to whether or not the producers should continue in association to meet the peculiar needs of the trade at the present time has now been happily averted by the decision on May 2 to continue the Association under the new agreement.

The Association was originally formed at the end of 1917 to operate from January 1, 1918, in order to meet a situation somewhat similar to that which the Rubber Growers' Association have had to meet, namely, the problem of over-production. While in the normal course of events from 1912 onwards the present production capacity of the existing China Clay works would not have been greatly in excess of demand, in consequence of the conditions produced by the war, markets that were expanding have been restricted and others have been almost entirely eliminated, Germany and Russia being notable examples. Consequently developments that were entered upon in 1912 and 1913 to meet the increasing demand indicated by the record of a million tons in 1912, have since reached fruition and created a volume of production which in the present contracted state of the world's markets is greatly in excess of demand. To meet this situation and to safeguard the interests of the China Clay industry as a whole, and to obviate severe price-cutting on the part of individual firms to secure the restricted markets, the Association was formed.

The main object of the producers in acting in unison where their mutual interests are concerned is to ensure that all shall have an equal share of the trade according to production capacity at prices that yield a moderate return on capital and a fair wage to the workers. It is in no sense a "trust," but an organisation to meet abnormal conditions in a manner which penalises nobody. The Association does not represent a monopoly because its activities are confined to the home producers of China Clay in Cornwall and Devon, and is not able to exercise any control over the Kaolins produced in other countries. It is therefore not in a position to extort unreasonable prices from middlemen buyers and consumers in consequence of the competition of domestic clays that has to be met in overseas countries. Its prices perforce have to be fixed according to an economical standard which must be placed as low as possible in order to secure and extend markets in foreign countries.

We mention these facts in order to allay any fears buyers and consumers may have that the effect of the producers' decision to enter into this new agreement might be to raise prices unreasonably. The fact is that the China Clay producers realise that the lower the prices at which they can sell their product the more rapid will be the opening up of a bigger demand, and seeing that the disparity between production and demand at present is so great, their policy will continue to be directed towards fixing prices that are compatible with the economic position. That they have maintained this policy up to now is shown by the fact that, compared with the pre-war cost of production, China Clay prices are at the present time several points below the percentage that would be justified if the figures revealed by comparative analysis were strictly followed.

The Producers' Association may be said to be an organisation which leaves all the members of it their individuality as separate entities while safeguarding their interests which are mutual, namely, in the grading of various qualities of clay in specific grades, and attaching thereto prices that are applicable to all the clays in their particular grades. The success of the Association has been demonstrated by the success with which it has enabled the industry to survive grave periods of depression and set-backs since its formation. The almost universal satisfaction this has given to those concerned is emphasised by the fact that the China Clay Owners' Federation, the Trade Unions, and all but a small percentage of the producers have welcomed the continuation of the organisation under the new conditions. Having now placed their industry on a thoroughly sound foundation as regards organisation, the producers look forward to the expansion of the continually growing revival in trade which still characterises its operations. They are greatly encouraged in this conviction by the fact that for the period to date this year the volume of trade exceeds by many thousands of tons the total trade of any similar period since the outbreak of the war.

Moisture Standard in China Clay

SOME years ago we published an article on moisture standard in China Clay as between the producer and consumer. The question is one which is constantly cropping up in the course of business, and we believe that if an agreed standard of moisture could be arrived at, it would be welcomed by the producer, even more than by the consumer. As our readers are well aware, China Clay readily absorbs moisture from the atmosphere. At the same time it cannot be dried below a certain percentage without calcining, so that to set a hard and fast standard would seem to be an almost impossible task.

It has been suggested that a competent analyst should be appointed at the point of shipment and that his report should be accepted by both parties; but to-day we appear to be as far off a settlement of this question as ever. It is admittedly a difficult proposition to solve, yet it appears to us one which might with advantage be tackled, and if a standard could be arrived at, this might free the producer from his present unknown responsibility.

The Chemistry of Colloidal China Clay

By Alfred B. Searle

This is the third instalment of the series of articles commenced in our March issue, dealing with colloidal clay in general and colloidal China Clay in particular.

Surface Tension

WATER and other fluids frequently behave as though they were contained in an extremely thin contractible bag or envelope which exerted an influence on their shape according to the manner in which it is applied to the fluid. This behaviour is due to what is known as surface tension, which can best be compared to the effect of a thin rubber bag enclosing the material under consideration.

All solid substances have surface tensions, they are more particularly noticeable in the case of plastic materials. This cannot be measured directly, but its nature and effects are clearly shown in some experiments made by Osborne Reynolds, in which a thin transparent india-rubber balloon was filled with a mixture of sand and water in such proportions that more than sufficient water was present to fill the voids or interstices when the grains were packed as closely as possible, but not sufficient to fill the voids when the sand was at its minimum density. The bag can be squeezed to any shape so long as the water does not rise to the surface. When the bag of wet sand was placed on a table it assumed a rounded shape as a result of the elasticity or " surface tension " of the rubber, and the sand settled into the position in which the grains were as close as possible, the surplus water forming a separate layer above the sand.

When the bag is subjected to vertical pressure it first changes its shape with no apparent resistance, but this soon stops. If the compressed bag is turned on its side and again pressed, no further change in shape occurs, but on releasing the pressure the bag goes back to its original, rounded shape. If the bag is vibrated whilst being squeezed, it can be pressed into a broad, flat slab, and remains soft so long as it is being squeezed, but tends to regain its original form when the pressure is released.

If there is no excess of water, the bag can be pressed into a flat slab which yields at once to pressure on its sides because pressure in that direction causes the bag to contract, but it is resistant to radial pressure, as that tends to dilate the sand still further.

If the slab is stood on edge it will support a heavy weight, but as soon as pressure is supplied on all sides, it resumes its original rounded shape.

If it is compressed in a mould it assumes the shape of the latter, and if the excess of water is allowed to escape, the sand becomes perfectly rigid, and will not change its shape unless the bag is torn.

These experiments of Reynolds throw a considerable light on the relation of surface tension to plasticity, and make it quite clear that surface tension is an essential factor in this elusive property of many colloids.

Solutions of salts usually have a greater surface tension than that of water, the increase being nearly proportional to the salt present. Strong bases usually increase the surface tension though ammonia and strong acids reduce it. The distribution of the salt in the solution and surface film is not uniform as the concentration in the film tends to change so as to reduce the surface tension. The film is, therefore, more dilute than the greater part of the liquid if the dissolved substance increases surface tension or vice versa. This only applies to true solutions and not to colloids. The concentration is much higher in the surface film of a colloidal solution than in the remainder of the mass.

The surface tension is reduced by heating the liquid, but not in any regular manner except in the case of single-phase liquids, such as pure water, alcohol, etc. Gront and Poppe* have estimated that the combined forces of adsorption and surface tension enable each particle of China Clay to retain an enveloping film two millionths of an inch in thickness. If a little more interstitial water is present the clay becomes " sticky " and adheres to external objects, whilst if a large excess of water is present, the whole mass becomes fluid. It is sometimes said that the thickness of the aqueous film depends on the molecular attraction of the solid particles, though this is only another way of describing the adsorptive power of the individual particles. In one respect clays are peculiar as regards surface tension ; it is obvious that the work necessary in order that a liquid may break down a solid or plastic mass will be less if the liquid has previously had added to it something which will lower the surface tension of either the liquid or the solid. The addition of an alkali to water increases its surface tension, yet when a dilute solution of alkali is added to a plastic clay it readily reduces it to a fluid ! It is almost impossible to measure the surface tension of a solid accurately, so that possibly an alkali may reduce the surface tension of plastic clay even though it increases that of water. The proportion of alkali required to reduce a plastic clay to a liquid is so small that it is difficult to imagine how it can have so great an influence unless one of the products of its reaction is enormously powerful, or unless the alkali destroys a small but very effective protecting agent which may be present, though as yet undiscovered, and so liberates the clay particles. The analogy may not be accurate, but it is easy to see that a very small quantity of carbon disulphide would dissolve sufficient of the rubber in Osborne Reynolds' bag of sand to have an effect almost as serious as though the bag had been removed completely ! Unfortunately, no experiment has yet been made on clay which is known to be equivalent to destroying the rubber bag.

* *Trans. Amer. Cer. Soc.*, 1912, p. 73.

Plasticity

A plastic substance is one which is deformed or altered in shape by pressure and retains its altered shape when the pressure is removed. It differs from a mobile liquid and from an elastic substance, both of which regain their original shape. Some plastic substances are also elastic when subjected to small pressures, and some highly viscous liquids are plastic. Many substances, such as metals, which appear to be non-plastic under low pressures are found to be plastic and to flow like liquids when sufficiently high pressures are applied.

Plastic substances may be made by mixing an amorphous powder such as chalk with a viscous liquid such as linseed oil. The structure of a plastic substance prepared in this manner is that of a series of minute solid particles each of which has adsorbed sufficient fluid to form a complete and highly viscous coating of fluid which is sufficiently thick to permit the solid particles to move relatively to each other when subjected to a pressure which is less in one direction than in others (*i.e.*, to a shearing force). The liquid film adheres to the solid particles as a result of its partial adsorption by the latter, and as a consequence of the natural viscosity of the liquid. Consequently, highly mobile liquids which have a low viscosity cannot be used to produce a plastic mass. Water behaves as a fluid of moderate viscosity as shown by the fact that wet sand is sufficiently plastic to be moulded into simple forms. The behaviour of water in this respect is partially due to its high surface tension—*i.e.*, to the fact that water behaves as though its free surface were covered with a rubber-like skin which contracts when the water is free on all sides and causes it to form spherical, or nearly spherical, drops.

Dried clay which has been reduced to powder may be converted into a plastic mass by mixing it with oil, and this substance is occasionally used in the manufacture of crucibles. Such a mixture is precisely analogous to putty which is made of whiting and oil and is equally plastic. For most purposes, however, it is much more convenient to use the clay with water in order to make it plastic, though the changes which then occur are much more complex than with oil, owing to the water having a chemical action on the clay.

It has even been suggested that there are three kinds of plasticity : (i) That produced by mixing an inert solid with a viscous liquid such as oil or glue ; (ii) that produced by mixing clay and water ; and (iii) that possessed by hot glass, wax, pitch, etc. Further investigations will probably show that one explanation will include all the apparent differences, and that even where no fluid is apparent it does actually exist.

It is important to notice that crystals large enough to be seen by the naked eye do not produce plastic masses, though those of microscopic dimensions appear to do so to a limited extent. Speaking broadly, however, only amorphous and colloidal substances can develop a high degree of plasticity, so that this property may be regarded—especially when well developed—as characteristic of the presence of colloidal matter.

The plasticity of a clay, as of most other materials, appears to depend on the proportion of fluid present and, therefore, on the fluidity of the material as a whole. Bingham* has found that zero fluidity in China Clay was reached with a mixture of 4 volumes of the clay per 100 volumes of the clay and water, but with a more plastic clay at a concentration of 19 per cent. Zero fluidity is reached when the liquid just fills the voids or interstices between the solid particles. If more solid particles are present than in a mixture of zero fluidity, the pressure required to produce a flow or change in shape is much greater and, according to Bingham, the character of the flow is changed from that of a fluid to a plastic substance as the new shape imparted to the material persists after the pressure which causes it has been removed.

In other words, there appear to be between the two extremes of solid and liquid an intermediate state in which a substance, possesses characters of both a solid and liquid substance. In this state it will flow like a liquid when subjected to a shearing force, but, unlike a liquid, it will not regain its original shape when the force is no longer applied.

In this intermediate or plastic state the substance must apparently contain a sufficient proportion of mobile particles—*i.e.*, of fluid—to enable the flow to occur under pressure, and yet not sufficient to allow it to occur (at any rate appreciably) under the action of gravity. There is no sharp line of demarcation between the plastic state and either the liquid or solid states, and under favourable conditions what are commonly regarded as dense or compact solids may become plastic. The conditions are favourable when the particles are suitably separated by heat, by an added interstitial fluid or by a similar fluid produced by the action of heat or pressure.

Too much fluid will make the material into a viscous liquid; if too little is present its plasticity will be very low or confined to the surface of the solid. Thus, when a metal is polished, its surface shows clear signs of plastic flow though these only extend to a very minute depth.

When a crystalline material such as sand is mixed with a suitable quantity of water the feeble plasticity developed and the volume of the mixture is slightly greater than that of the dry sand, because the particles are separated by the water. The increase in volume is greater with fine sand than with coarse, because the smaller particles have a larger surface and are more readily separated. The percentage of voids in a material composed of spheres of equal size can be calculated, and is independent of the size of the spheres. In the case of clay and of natural sand, however, the grains are neither spherical nor uniform in size, so that no definite figure can be found which connects the voids or interstices with the plasticity.

The proportion of water it is necessary to add to a clay in order to bring it to a definite consistency is a rough measure of the plasticity of the clay and indirectly of the amount of active colloid material present.

Plasticity is not due solely to the presence of a fluid which separates the solid particles; it also involves certain phenomena related to surface tension—*i.e.*, to a force which prevents the particles from separating so completely from each other that the plastic mass does not retain its shape.

(To be continued.)

Kaolin in Russia.

THE Prodasilikat Authority is authorised and requested to take over the preparation of all the raw material for the porcelain and allied industries, particularly as to the Gluchoff (Adelheim's) kaolin. The Tchebarkul kaolin on the Ilmen hills is included in the plan. In regard to English kaolin, taking into account the terms, cash, in gold, it has been decided to do without, and use only Russian clay.

* *Journ. Amer. Chem. Soc.*, 1911, p. 278.

China Clay and its Retention Properties

As a Loader and Filler for Paper

SOME practical observations on loading and filling matrials used in paper manufacturing were contributed by Carl C. Schneider, chemist to Knowlton Brothers, Inc., Watertown, N.Y., at a meeting of the Northwestern New York Division of the American Pulp and Paper Mill Superintendents' Association. Among the substances recognised as loading and filling materials, he mentioned kaolin, domestic and imported, talc, gypsum, precipitated chalk, asbestine, pearl hardening, heavy spar and witherite. The fillers just mentioned, with perhaps others not named here, are sold under all kinds of names. Certain colours, as umber, ochre, red oxide, etc., also increase the ash of the paper. The loading effect of these materials is, however, only an incident, and as colouring value is their real purpose, no further consideration will be given these substances in this paper. Filling and loading agents are added to the paper for several reasons.

Fillers tend to increase the weight of the paper, improve the feel, make a better printing surface, enable the paper to obtain a better finish on calendering, make it more opaque, and also enable it to take printers' ink better. A filler is, therefore, not to be considered as an adulterant with the exception of one single instance, in connection with which, a very cheap paper is demanded. The kind of loading material to be used depends on the grade of paper to be made, and the qualifications which the latter has to possess.

The principal qualities a filler has to possess are: Colour, fineness, absence of grit, iron, calcium carbonate, mica, and moisture. The colour must be as pure a white as possible. In judging the colour of clay or talc, it is advisable to make sure that the white colour has not been artificially improved through the addition of a blue colouring matter; very often ultramarine blue. The fineness of the filler is important as regards retention. This, of course, does not alone determine the degree of retention. Other factors in this respect are: The kind of stock used, slow or free beating stock, a thick or thin sheet, light or heavy suction, as also the amount of rosin size used. The fineness of the loading agent is best determined with the microscope.

Mr. Schneider cited the results of some experiments made in a German mill to determine the loss of filler, clay, etc., at different parts of the paper machine. The ash in the air-dry stock at various points was as follows:—

	Per cent. Ash.
Stock from the chest	20
Stock just before suction boxes	19
Stock after the couch	15
Stock after the first press	14
Stock after the second press	13·5
Finished paper	13

The stock was 25 per cent. sulphite and 75 per cent. ground wood. Weight of paper was 50 grams per square meter. The retention of filler fluctuates between 30 per cent. and 90 per cent. of the amount originally added, 50 per cent. is to be considered satisfactory. Grit, if present in any considerable amount, will cause unnecessary wear of the wire felts and jackets, also will make pinholes and possibly may give serious trouble in printing.

Grit is best tested for, by either the flotation process or placing a certain amount on a standard mash screen and washing it with a spray of water until the water running away is perfectly clear. As to the amount of grit to be allowed, nothing can be stated, as no standard has been set up. I have however, seen a suggestion from England as follows:—

China Clay for coating not more than 1 per cent. grit.
China Clay for fine paper not more than 0·25 per cent. grit.
China Clay for news not more than 0·5 per cent. grit.

Low grade clays containing from 5 per cent. to 10 per cent. of mica should be described commercially as "mica clays."

Mica has the same bad effects on paper as grit of another nature, besides producing shining spots on the paper.

Iron should be present in as small an amount as possible for the same reason as in all other papef-making material. Iron in the paper, introduced with the filler or in any other way, will form with resinous matter in the paper resin-iron salts which will cause the paper to turn yellow in a short time. Two per cent. oxide of iron should be the maximum in clay.

Calcium carbonate is the next thing to watch for. This particular article will raise the deuce with you for fair—namely producing foam plentifully and increasing your alum consumption sky high. You should not find over 4 per cent. calcium carbonate.

Now let us give the moisture some consideration. Very little attention has been given to that matter, but it nevertheless deserves careful consideration. An experiment made by James Strachan, of the Donside Mills in Scotland, gave the following results :—

A sample of absolutely dry china clay weighing 100 grams, exposed to an atmosphere with an average relative humidity of 88°, absorbed moisture as follows :—

In 1½ hours, 0·35 gram moisture.
In 3 hours, 0·5 gram moisture.
In 23 hours, 0·74 gram moisture.
And in 11 days, 1 gram moisture.

The clay was exposed in a shallow tray and turned over every day. Clay has been found to contain as much as 12 per cent. moisture, and, as shown above, only regains, after drying on the paper-machine, 1 per cent moisture, in this case a loss of 11 per cent. only through moisture would be suffered. In my opinion this is something to think about.

Loading agents reduce the strength of paper, hence when the paper must have a certain strength and filler has got to be used, a better fibrous stock must be employed, and more care used in the making of the paper.

The ink resistance is another thing impaired by the filler. In order to keep the proper sizing effect more rosin size must be used.

In order to determine the kinds of filler used from the ash of the paper, it is essential to know the chemical composition of the various fillers. As an example, the analysis of one sample of English and American clays may be given :—

	English.	American.
Silica SiO_2	45·92	45·67
Alumina Al_2O_3	38·43	37·86
Ferric Oxide Fe_2O_3	0·71	1·48
Lime CaO	1·18	0·05
Magnesia MgO	0·21	0·01
Alkalis (K_2O)	0·78	0·80
Total water	12·77	13·22

The other loading agents named are: Gypsum, a natural calcium sulphate, $CaSO_4{-}2H_2O$.

Pearl hardening is an artificial, hydrated calcium sulphate, made by precipitating a solution of calcium chloride with soidum sulphate. Two forms are known, flat tabular crystals or minute, needleshaped crystals.

Talc is a hydrated silicate of magnesium, which is prepared for the market by grinding the talc stones to fine powder, washing and screening.

Asbestine is nearly pure magnesium silicate extensively prepared in St. Lawrence County, N.Y.

Heavy spar is a natural occuring barium sulphate, $BaSO_4$.

Witherite is carbonate of barium, $BaCO_3$.

Because of their high specific gravity neither of the two last-named fillers is quite satisfactory as a filler for paper.

China Clay Company's Appeal Fails

A Divisional Court of the King's Bench, consisting of the Lord Chief Justice and Justices Shearman and Branson, recently had before them the case of the Wheal Remfry China Clay Brick and Tile Co., Ltd., *v.* the Corporation of the City of Truro, on an appeal by the China Clay Co. against a decision of the Justices of St. Columb-in-Pydar.

The Corporation of Truro contended that the appellants were mining near a navigable river, and had caused filth to be emptied into it in contravention of the statute. On the other hand, the China Clay Company, argued that they were not working a mine, quarry, or pit near a navigable river within the meaning of the statute, and that there was no evidence on which the Justices could find that filth was emptied into the river and that the material that got into the river was not "gravel, earth, rubbish, or filth," within the meaning of the Act.

Counsel argued that the Justices had misinterpreted the Act.

Their Lordships dismissed the appeal, with costs.

Tramways for China Clay Pits—II.

By China Clay "Captain"

In last month's issue the "metre" was described as the "point" most frequently used in making branch lines on the temporary tramways of the clay mines. Probably it is the simplest "point" in existence, yet when simplicity and utility go together the simplest contrivance is invariably the best.

In the sketch of a 15 ft. metre given below (Fig. 1) it will be seen at a glance how a branch is made and how the tram wagon, by "turning the metre," is diverted right or left. The pointer is made in the smith's shop by cutting away the rail-flanges for a distance of about 15 in., and the vertical section of the rail-end heated, hammered out and shapened like a wedge, the extreme end being about ⅛ in. wide.

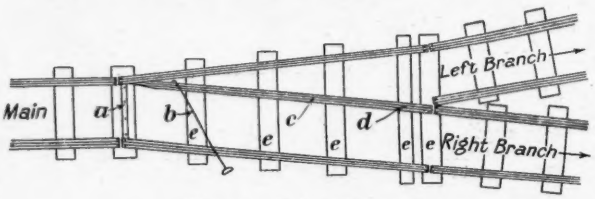


FIG. 1.—THE "METRE."

The distance of the pin-hole from the other end is determined by the length of pointer—being $\frac{1}{12}$ of the whole, really 1 in. per ft.—for a 12 ft., 1 ft. from end; 18 ft., 18 in., and; as in our illustration, 15 in. for a 15 ft. metre.

In Fig. 1 *a* is a sliding plate, 1¼ in. by ¼ in., with countersunk holes to receive nail-heads; *b* is the metre-crook, ½ in. round iron 3 ft. long, with hand-grip and crook; *c* is the pointer, made up from 15 ft. rail; *d* is the metre-pin, ⅜ in. round iron, length 4½ in., with bevil head to fit countersunk hole; while *e* comprises five long wood sleepers ranging from a foot long to about double ordinary length.

The Turntable

When it is necessary to "branch off" at right angles to the main line and there is insufficient space for a metre and sharp curve, a "turntable" is introduced, but seldom unless it is impossible or impracticable to have a point, because the disadvantage of a turntable is that the wagon must be stopped and poised on the centre before turning about, and unless the table is kept clean and well oiled a lot of energy is expended in "slewing" it round, especially with full wagon loads. Instead of a table I have heard some workers speak of the advantages of a skidding-plate, but having never seen one at work I can give no opinion about it.

Crossings

When tramlines intersect in one plane, either as a square or diamond crossing, and the wagons are not required to be interchangeable from one track to the other, but only simply crossing over, the rails are cut for the wheel flanges and guard rails provided. The whole outfit is generally made locally, riveted down to a steel bed-plate. I have seen such crossings a real credit to the local smiths, particularly as they have to make them without the assistance of machine tools such as the big railway workshops are equipped with.

Bridges

When a tramway goes over another and there is clearance, a bridge of some sort is constructed either of wood, steel girder, bricks or stone. But in a case where there is *not* enough clearance and it is desired to pass a tramline over a railroad, cartroad or another tram road, it might be necessary on some days to dismantle it half a dozen times to let the traffic pass. At such a place a swing-bridge something like the one shown in Fig. 2 would be found very useful; instead of taking two or three men to haul back heavy rails and planks, a lad could swing it clear. It could be framed up by local tradesmen with the ordinary materials usually found at the works. The detailed sketch given below illustrates the main features. Special modifications to suit local conditions would naturally suggest themselves during construction to intelligent workmen.

The construction of the swing-bridge is indicated in Fig. 2, as follows:—(1) Outside planks resting on iron supports bolted to main stretchers; (2) centre plank *hinged* to turn up, to allow bridge to swing back; (3) one post the width of stretcher in advance of the other to give clearance when swing is out of action; (4) the posts set back in a recess, out

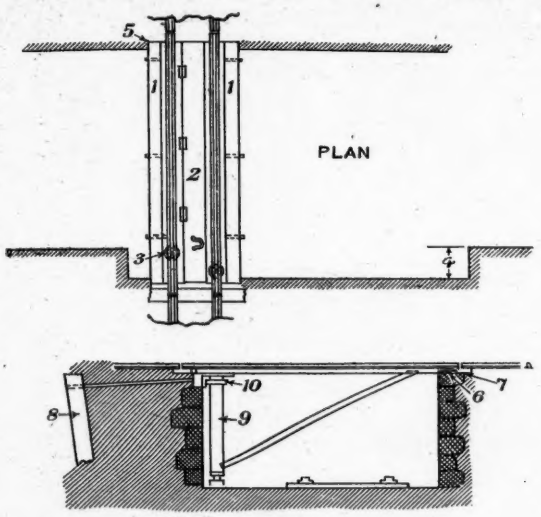


FIG 2.—PLAN AND ELEVATION OF SWING BRIDGE.

of the general alignment, when not in use; (5) when the bridge is in position the stretchers and rails are bearing at ends; (6) to make it easy for stretcher to move off or on, insert a small solid iron wheel to run it in and out; (7) have a check, staples and bar to keep in position; (8) fix post in ground and bars to keep face board rigid; (9) wood post, say 8 in. square, with 2 in. spindle and iron ring at the bottom, the top end encased in the flanged end of a piece of 6 in. or 7 in. pump, bolt the stretcher to flange, and the smooth barrel of the pump is suitable for the "half-moon yuk" to encircle it; (10) so arrange the yuk and bolts that they may be tightened up occasionally to counteract the tendency of the bridge to drop forward.

English China Clays, Ltd.

Improving Trade Prospects

THE fourth annual general meeting of the company was held at the Institute of Chartered Accountants, Moorgate Place, London, on Monday, April 30. Mr. R. Martin (chairman and managing director) presided. Mr. H. S. ANDREW (secretary) read the notice calling the meeting and the report of the auditors.

The CHAIRMAN, in moving the adoption of the report, first referred to the accounts, and said the net profit for the year ending December 31 last amounted to £62,343, as compared with a loss in the previous year of £32,102, showing an improvement of £94,444. This was satisfying in view of the general depression which had prevailed in British and foreign trade during the period, and he thought it was even more gratifying when it was borne in mind that the result had been achieved on an output of less than half of which their works were capable. Cash at bank amounting to £71,615, against £343, showed a vastly improved position, and had enabled them to pay off all arrears on the preference shares, and would also enable the company to take full advantage of any improvement in trade that might develop. He believed the corner had been turned in spite of the fact that the demand for China Clay was still a little more than half the capacity of the clay works. This was noticeable in the home paper and pottery trades, and was distinctly in evidence in the demand from America, where consumption had almost reached pre-war level. On the Continent the adverse rates of exchange militated against any recovery of the market, although even there there were not wanting indications that a settlement of the political crisis of the Ruhr difficulty would be promptly followed by an increase in the demand. The directors had constantly before them the possibilities of finding new markets for specially prepared China Clay, and a licence had been patented from which it was anticipated a considerable development would evolve. The producing stage from this had not yet been reached, but small tests had been submitted to various users who had expressed their satisfaction with the results so far obtained. The necessary plant for dealing with the clay on a large scale was being installed, and the works should be in operation in the course of a few weeks. The works generally were in a highly efficient state, overburden was well removed and they were in a position to deal with any demand. Cost of production had shown a material drop over 1921, and if output increased those costs would naturally decrease in proportion. Regarding the prospects for 1923, he thought they might look forward with confidence to better trade and better returns on their capital. The year opened with a considerably increased demand, and tonnage was being booked ahead, which was a very good sign.

Associated China Clays, Ltd.

Mr. T. MEDLAND STOCKER (managing director) said: One of the most important matters which the directors have had to deal with recently had been the position of the Associated China Clays, Ltd. This association was formed during the war when the China Clay industry was in a position of extreme difficulty, in order that, without demanding undue profits from consumers, competition might be avoided, and that the different companies engaged in the industry would be able to continue their existence and to employ labour in the ordinary developments of the industry. That purpose had been fulfilled by the Associated China Clays, Ltd., but during the last year difficulties arose which made it essential to alter the character of its agreements with its members. Very difficult negotiations had extended over a considerable period, during which the interests of China Clay producers and the views of the landlords had been taken into account; those negotiations were still proceeding, and it would be deplorable from all points of view if they were not successful. It must be borne in mind that the productive capacity was almost double the existing trade. The interests affected were somewhat diverse, but should those negotiations fail a very long period of cut-throat competition must ensue, many of the weaker companies would cease to exist, their properties would probably be purchased by speculative buyers, who would continue the competition in price. Trade would be disorganised and capital developments would cease. In reference to their new product, their experiments on the purification and production of clay bordering on the colloidal condition had extended over a long period of years. Their object had been to place on the market a superior article to anything previously produced, and they had been informed by technical experts that they had been successful, and immediately their plant had been erected they would endeavour to create new markets.

Mr. WALTER SESSIONS (managing director) said he thought shareholders might regard the result of the year's work as gratifying. The difficulties the management had had to contend with had included the usual ones incidental to the organisation and running of a large industry, and they had had to contend with restricted markets which fortunately were showing a tendency to expand. This expansion of trade was naturally very necessary to all industrial concerns, and any action which might have a tendency to react upon expansion could not be regarded favourably. The natural growth of exports produced more employment and rectified many of the ills from which humanity suffered when trade was declining. It might be a matter of opinion how far a Government should interfere directly with industry, but there could hardly be a difference of opinion in regard to the demoralising effect of undue taxation and heavy local rating. It was certainly pleasant to find even a small relief under the last Budget. One would like to see a more generous disposition to appreciate the position. That, together with further definite reduction of Governmental expenditure, would assist trade considerably, and a further impetus would be given with a stabilisation of exchanges.

The resolution was carried unanimously.

Other formal business having been transacted, the proceedings closed with a vote of thanks to the chairman, directors and staff.

China Clay Notes and News

China Clay Waste Problem

Like some other industries under the necessity of using streams into which to empty their waste products, the China Clay industry has had to contend with it for many years. It has done so more or less successfully, more from a preparedness to take a risk with the powers that be than from remedial action on their own part. This is not saying that China Clay works, where the problem has been more real than at some others, have not done what they could to minimise the trouble to navigable rivers into which they have been emptying their refuse, but there is always a residue of micaceous material that cannot be dealt with on the works, that must be got rid of. Those China Clay works situated in parts of the St. Stephen's and St. Dennis China Clay areas on the watershed emptying into the Fal have been most seriously affected because they have had to empty into a navigable river, whereas those in the St. Austell district have been more favoured by nature through being able to empty into streams that do not lead into navigable rivers, but flow right on to the sea. The North Cornwall China Clay Works were some years ago faced with legal action on account of the alleged pollution of Camelford river by the escape of China Clay refuse into it. They met the complaint by converting a tract of waste land into a huge natural reservoir, into which their waste product is emptied.

Wheal Remfrey China Clay Works, against whom Truro Town Council's action has been fought through to the Appeal Court, had hoped, as had several other works which are in the same predicament, that what is really a test case would have gone in their favour. The decision places them under the necessity of making some provision for their waste material so that it shall not find its way into the Fal river in such a way as to silt it up to the detriment of navigation. How they will deal with it is a problem. Either they will have to utilise derelict pits and other waste areas, like North Cornwall China Clay Works have done, or make leats to flow into streams that do not lead into navigable rivers and are not capable of being polluted to the detriment of anglers, as was alleged to be the case in North Cornwall. To find conditions that will meet these objections will not be easy.

That the Truro City Council are determined to take the fullest advantage of the power which the law gives them is evidenced by the report presented by the special River Committee at their meeting on May 8. They expressed great satisfaction at the result and congratulated those who had taken a prominent part in the case. The committee recommended that a circular letter be sent to all the China Clay companies in the watershed calling their attention to the judgment, and informing them that the Corporation, having decisively vindicated their rights, would feel it their duty to maintain them by pressing for strict compliance therewith, so that the nuisance of sending China Clay refuse into the river be discontinued forthwith. It was further decided to write the Anchor China Clay Syndicate that in the event of any repetition of the discharge of waste products into the river from their Fal Valley Mica Works legal proceedings would be taken without further notice. The Mayor congratulated Mr. Sitwell and those associated with him who were plucky enough to take this bold stand against vested interests.

At the same time we would comment that it is a pity some better way could not be found for dealing with this real difficulty with which the China Clay works have been faced, for, however justified they have been proved to be, the effect of Truro City Corporation's action is to hamper the staple industry of the neighbourhood, vested interests or no.

Shrinkage of Kaolin in Drying

KAOLINS contain, as demonstrated by Mr. T. Schlösing in a paper read at the French Academy of Sciences, various percentages of colloidal particles which swell in contact with water, to return to their normal condition in drying, contract and form a kind of hard close network around the other inert particles with which they are associated. In studying this question, Mr. A. Bigot measured the linear shrinkage and loss of water during drying, in French Kaolins. The samples were moulded in plaster 8 metal moulds, 3·9 by 0·787 by 0·787 inches. The finely ground materials, mixed with suitable proportions of water, were made into a soft and a firm paste, or a moist powder, the three states in which raw materials are worked in the ceramic industry. The soft paste samples were made by hand in plaster moulds, and those in firm paste or humid powder in metal moulds, at variable pressures. The samples were taken from the moulds, weighed and measured, then slowly dried, the length and weight being frequently ascertained. Those pressed in humid powder lost weight but did not shrink, whilst the others decreased in weight, with an initial shrinkage which ceased before the sample was quite dry. In all the pastes, a part of the water served to inflate the colloid and disappears during shrinkage; this is the *colloidal* water. The remaineder of the water, or *interposed* water, fills the spaces between the particles. The colloidal water should be evaporated slowly to avoid cracks; but as soon as shrinkage ceases, the objects can be dried rapidly. Worked in a soft paste Kaolin shrinks and hardens in drying and has then colloidal plasticity. This last, however, only develops in presence of water. When worked with petroleum, Kaolin does not shrink in drying. The effect of free silica is to take the place of some of the colloidal and neutral particles and make the substance less plastic and less porous. Plasticity can be estimated by dividing the weight of colloidal water by the total water absorbed and multiplying by the shrinkage.

NEW MECHANICAL JETTY AT FOWEY. [Photo Trethewey

Erected at a cost of £300,000 this jetty will enable ships to complete loading at any state of the tide.

New China Clay Plant.

To the Editor of THE CHEMICAL AGE.

SIR,—In your issue of April 21, 1923, under the above heading, you quote a statement from the London Correspondent of *Chemical and Metallurgical Engineering* with reference to the Standardised China Clay Co., working the Gee Centrifugal Process.

As sole agents for the sale of the products made by the Standardised China Clay Co., Ltd., we would take the liberty of pointing out that whereas the statements made are substantially correct, you have been led into an error (presumably owing to the information reaching you from New York) in assuming that the works are situated in the U.S.A., whereas they are actually at Belowda, near Roche, in Cornwall.

As regards the number of grades, although four or more grades can be obtained, the point of the division being quite arbitrary, it has been found that a division into three parts only—*i.e.*, superfine, fine, and No. 3 is commercially the most advantageous.

Might we also point out that the statement, " the coarser product containing a higher percentage of silica and other impurities," is rather putting the cart before the horse.

The facts are that the superfine contains no silica, mica and other impurities, and the fine only a trace, thus leaving the No. 3 to be burdened with the excess.—Yours faithfully,

For and on behalf of
STANCOURT, SONS AND MUIR, LTD.,
FRED. STANCOURT, Managing Director.

[*The paragraph referred to by our correspondent (see page 16, April issue) was a quotation from " Chemical and Metallurgical Engineering " of New York, written, as we stated, by their London correspondent, and dealt with the English China Clay industry.*]

The "Association" to Continue

Unanimous Decision of China Clay Producers

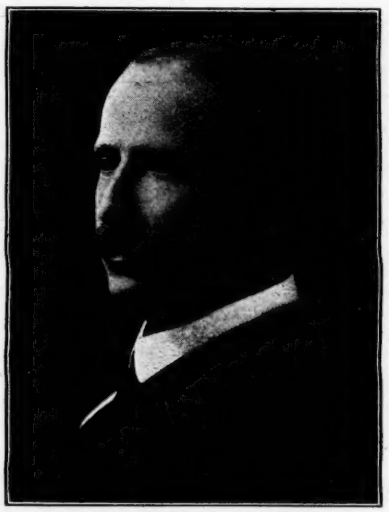
THERE was a large assembly of the China Clay producers of Cornwall and Devon at St. Austell on Wednesday, May 2nd, to decide the fate of the China Clay Producers' Association, which has been the subject of so much discussion and concern in China Clay circles for some time. As a result of negotiations and slight compromises, it was decided that the support given to the new agreement was sufficient to warrant the Association being continued.

The Hon. H. D. McLaren, C.B.E. (chairman of the Associated China Clays, Ltd.), presided, and was supported by Mr. Reg. Martin (vice-chairman) and Messrs. T. Medland Stocker and J. W. Higman, managing directors.

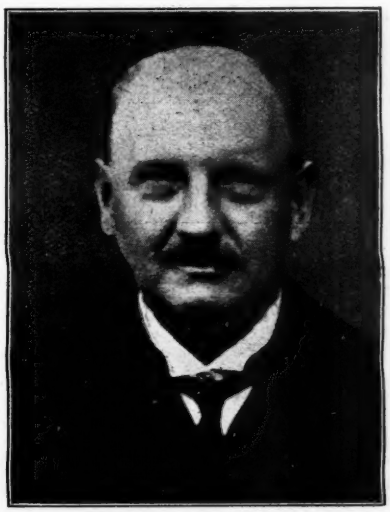
The Chairman stated that at the last meeting there were some firms who had not signified their adherence to the new agreement, and since then efforts had been made by various members of the Board with a view to securing their adherence to the Association. He was glad to say that their efforts had been met with a very substantial degree of success. There was one direction in which no progress had been made, and that was with two companies who were under the old agreement. The managing director of those two companies had intimated that while he could not see his way to sign the new agreement it was not his intention to cut prices. There was also the possibility of Mr. Varcoe's companies coming in later on. There were two other companies who had not signed, representing a standard output of under 15,000, but, on the other hand, two other companies who were not in the Association before had come in and their output was equivalent to that of these two companies who were remaining out. Of the other two groups who desired modifications in the terms of the new agreement before signing, one desired a modification of the contributions payable by firms who exceeded their quota. After long discussion, the managing directors and the Board had agreed to recommend to the meeting a slight alteration in the basis of the contributions payable. At present proposed they were graduated at 15 per cent., 25 per cent., and 50 per cent. for over-shipments up to the maximum; the compromise proposed that they be graduated less rapidly at 15, 22½, and 33⅓ per cent. up to 50 per cent. over-shipments, and 50 per cent. afterwards. This compromise, while meeting with the acceptance of the group concerned, would apply to all producers alike, and a clause to that effect would be inserted in the new agreement. With regard to the other group, they required as a condition of their signing that their quota for 1923 be fixed at a figure representing 57 or 58 per cent. of their standard output. Based on last year's total trade they would not be entitled to such a large quota. If, however, the trade continued this year as it had done so far probably the output would reach the neighbourhood of 58 per cent. If that group were definitely prepared to sign the agreement on those terms, the managing directors thought, although they were against giving special terms to any company, the risk of the difference between them was so slight that it would be in the interests of the trade generally to accept it.

Continuing, the chairman said he would strongly recommend them to continue the Association. He had no doubt whatever that the Association had been of enormous benefit to the China Clay producers, to the men employed and to the district of St. Austell generally. If they did not continue the Association there would be a period of competition where they would be giving away hundreds of thousands of pounds to consumers, and very largely to the United States and other foreign countries, which would be taking money out of the pockets of those whom they employed and part of the proper remuneration of the capital they had put into the business, which should stay in that district. They had taken increased powers in the new agreement, and he thought members would support the directors in seeing that they were more strictly enforced in the future than in the past if they decided to continue the Association. He moved that, subject to the compromises recommended, the Association be continued.

In seconding, Mr. T. Medland Stocker pointed out that the result arrived at, after a great deal of negotiation and effort, was that those signing the new agreement would represent 95 per cent. of those who were in the old association.



Mr. F. R. LOVERING.



Mr. MEDLAND STOCKER.

Mr. Montague Rogers, of Tehidy Minerals, said he represented a comparatively small section of China Clay interest, but from the attention that had been paid to them lately he was beginning to think they were of some importance. He was a great believer in the Association and its value in stabilising prices and safeguarding the interests of the industry. It had all along been their intention of signing the agreement, and they were taking steps to erect another dry which would give them the right to the quota they had asked for. He supported the resolution.

Mr. J. Rogers, also supporting, said he thought they were justified in making the slight compromises to bring about the cohesion of those who had been doubtful. He did not hesitate to say that it would be a calamity to the industry if the Association did not go on.

On being put, the resolution was carried with acclamation.

Mr. J. Rogers then moved that their best thanks be tendered to the chairman, the managing directors and to Mr. F. R. Lovering and Mr. Hart Nicholls in their untiring efforts in assisting in bringing about that happy result.

Responding, the chairman minimised his own share in the negotiations, and singled out Mr. Medland Stocker and Mr. F. R. Lovering for special mention. They had been most assiduous, patient and persevering.

Industrial and Trade Reports

(From our Own Correspondents and Other Sources)

Great Britain

The British Paper Trade.

The tone of the market is not at all good. There are rumours of a general price advance, and, in fact, some mills are already quoting an ½d. to a ¼d. per lb. extra on printing and E.S. writing papers. In view of increased costs, higher prices are naturally inevitable, but it is to be feared that they will come too late for some mills and merchants. Consumers are not displaying any considerable amount of anxiety over the prospect. Their's is a set policy of restricted buying and minimum stocks whatever the future may hold in store. A great many of them are possibly ignorant of the conditions with which the papermakers are faced; but it would probably make no difference if they were fully aware of the increased cost of pulp and coal.—*World Paper Trade Review.*

English China Clay Prices.

China Clay, in bulk, f.o.b. Cornwall, 28s. 9d. to 71s. (highest grade) per ton. The extra charges (including filling) per ton for bags and casks are:—Single bags, 9s. 6d.; double bags, 16s. 6d.; half-ton casks, 19s. 6d.; quarter-ton casks, 22s. 6d., in casks, with extra iron hoops, 2s. per ton more.

United States of America

The paper industry in the States, on the whole, still maintains tue activity which obtained during the past several months, although some of the mills report working up on the orders on hand. Owing to the advanced cost of manufacturing coated paper, there is a tendency to increase the production of substitute qualities of paper. This naturally tends to somewhat lower the demand for best coating clays in favour of other grades.

The potteries continue busy on the whole, there being a demand for all ceramic products. Widespread interest has been centred upon the trial in the U.S. Court at New York, of several of the leading men in the Sanitary Division of the pottery Industry. These men were charged with violation of the anti-trust laws relating to restraint of trade, etc. Most of the defendants were found guilty; the President of the Association was sentenced to ten months in prison and was fined $5,000; several of the others who were found guilty received jail sentences and heavy fines. The defendants have appealed from the lower Court, and the final outcome will not be known for some time. The sanitary potters are large users of China Clay.

China Clay Prices in U.S.A.

Imported China Clay is in especially good demand at present. Most clay dealers believe that if there is any change in the present quotations it will be an upward one.

Available quotations follow:—

English clay, ex steamer, per ton	14.00 to 20.00
Domestic clay, washed, per ton	8.00 to 10.00
Domestic clay, unwashed—	
No. 1 per ton	6.00 to 7.20
No. 2	5.00 to 6.00

India

Indian Clay and Pottery Trade.

In the annual report of the Department of Industries (Bombay Presidency) we learn that Mr. E. R. Fern was in charge of the Pottery Department of the School of Art, Bombay, throughout the year. Twelve students were under instruction.

Experiments in the manufacture of brown teapots were continued from last year and brought to a successful conclusion. White earthenware cups, saucers and teapots were also made experimentally. The scheme for the production of flooring tiles and teapots on a semi-commercial scale was sanctioned during the year, but owing to the provision of funds being doubtful, the plant required could not be ordered till May and actual production has therefore been delayed. Work on the new kiln has, however, been commenced and 100 tons of Kirol clay have been stocked and are being levigated. It is hoped that output will commence before the end of the year.

Further work was done on behalf of the Development Directorate. Mr. Fern visited the clay beds at Trombay and Kalyan and the brick factory at Vasind and submitted reports. Five hundred red bricks were also prepared for the Directorate from mixtures composed of 58 samples of clay from the brick area acquired at Kalyan. Ninety-three experiments were made with these clays and for the final test a kiln of 500 bricks was prepared. This represented a good deal of work, but the result satisfied the Superintending Engineer, No. IV. Project Division, that very good bricks can be made of Kalyan clay with appropriate machinery and expert supervision.

Other work at the School of Art included 25 experiments in the manufacture of pipes for the chemical industry. They were all more or less successful, and two of the tests have been selected to produce pipes of a useable size for a final test at the Cordite Factory, Aravankadu. Majolica glazed palm pots in artistic colours were also produced and 48 test trials were made for various coloured glazes. The vases were produced in some of the colours tested and were exhibited to the public. Experiments in the use of waste mica were unsuccessful.

Registered Exports of China Clay

Particulars are given below of the registered exports of China Clay, the produce or manufacture of the United Kingdom from the United Kingdom to each country of destination during the month of April, 1923.

Country of Destination.	Quantity. Tons.	Value. £
Finland	2	8
Sweden	710	2,119
Norway	1,076	2,167
Denmark	482	1,320
Germany	769	2,442
Netherlands	1,022	2,402
Belgium	3,899	8,107
France	2,407	5,472
Switzerland	187	452
Portugal	10	63
Spain	2,318	5,534
Italy	1	17
Austria	98	320
Hungary	474	1,560
United States: On the Atlantic	20,821	50,954
On the Pacific	191	828
Mexico	71	358
Argentine Republic	2	50
Bombay, via other Ports	2,206	7,938
Madras	50	241
Bengal	207	866
New South Wales	13	51
Canada, Atlantic	10	23
Total	37,026	93,292

Note.—As regards goods registered on and after April 1, 1923, the expression "United Kingdom" does not include the Irish Free State.

American Demand Keeps Fowey Busy.

Vessels taking 6,000/7,000 tons of China Clay for the American markets have been keeping Fowey busy during the past month, and at the time of writing (middle May) have every indication of continuing. Big shipments have included the following: Japanese—Kifuku Maru, 6,500 tons to Portland Maine; Montreal Maru, 7,500 tons to Montreal and New York; Pacific Maru, 7,000 tons to Portland Maine; Scotland Maru, 6,500 tons also to the States; British—Alness, 5,500 tons to New York; Fanad Head, 7,000 tons. There have been several 1,000 to 2,500 tons shipments to Continental ports, including Dutch Merwestroom, 1,800 tons to Amsterdam; Norwegian Stella, 1,170 tons to Bilbao; British Main, 1,000 tons to Rouen; Belgian Picadier, 2,500 tons to Brussels; Swedish Hild, 1,500 tons to Norrkoping; British Sotero, 1,000 tons to Genoa. A total of 62 vessels were dealt with at the Fowey jetties during April, comprising ocean-going steamers, coasting steamers and schooners.

Shipping and Export News of the Month

We give below the latest particulars relating to arrivals and sailings of ships engaged in the China Clay Trade, at the principal British clay ports. Registered exports of China Clay with countries of destination, and other shipping and export matters are dealt with.

Fowey Shipping—April, 1923

Arrived.		Vessel's Name.	Sailed.	
April	1	S.S. *Merwestroom*	April	7, Amsterdam
April	2	S.S. *Stella*	April	9, Bilbao
April	2	S.S. *Longston*	April	7, Antwerp
April	2	S.S. *Main*	April	7, Rouen
April	2	S.S. *Brier Rose*	April	9, Glasson Dock
April	3	M.V. *Isabel*	April	4, Pentewan
April	3	M.V. *Regina*	April	6, Pentewan
April	3	M.V. *Hetty*	April	4, Gravesend
April	3	S.S. *Falmouth Castle*	April	7, Weston Point
April	4	S.V. *Regina*	April	6, Poole
April	4	S.S. *T. W. Stuart*	April	9, Newcastle
April	4	M.V. *Katie*	April	12, Gravesend
April	4	S.S. *Coaster*	April	9, Gravesend
April	5	S.S. *Pansy*	April	10, Weston Point
April	5	S.V. *Hebe*	April	27, Charlestown
April	6	S.S. *Crofter*	April	10, Methil and Bo'ness
April	6	S.S. *Hagfors*	April	11, Sarpsborg
April	6	S.S. *Devon Coast*	April	11, Liverpool
April	7	S.S. *Marnix*	April	12, Pasages and Gijon
April	7	S.V. *Paix*	April	8, Charlestown
April	8	S.V. *Regina*	April	12, Plymouth
April	8	S.V. *Marie Edmee*	April	26, Leghorn
April	8	M.V. *Liesbet*	April	15, Seville
April	8	S.S. *Montreal Maru*	April	21, Boston and New York
April	9	S.V. *Frances and Jane*	April	23, Weston Point
April	9	M.V. *Isabel*	April	13, Pentewan
April	10	S.S. *Picardier*	April	23, Brussels
April	11	S.S. *Walloton*	April	17, Grimsby
April	11	S.S. *Moss Rose*	April	13, Barrow
April	11	M.V. *Kongedybet*	April	16, Oscarshamn
April	11	M.V. *Lydia Cardell*	April	18, Antwerp
April	11	S.V. *Alert*	April	18, Runcorn
April	11	S.S. *B.W. III*	April	17, Antwerp
April	12	S.S. *Penrhyn*	April	14, Ridham
April	12	S.V. *Elisabeth Eff*	April	28, Gothenburg
April	12	S.S. *Nystrand*	April	17, Bo'ness
April	13	S.S. *Edern*	April	17, Aberdeen
April	13	S.S. *Eleth*	April	18, Preston
April	13	S.V. *Flying Foam*	April	19, London
April	14	S.S. *Main*	April	21, Rouen
April	14	S.S. *Guelder Rose*	April	19, Preston
April	14	S.S. *Pacific Maru*	April	30, Portland, Me.
April	14	S.S. *Scotland Maru*	May	4, Portland, Me.
April	15	S.V. *Hayo*	April	27, Hamburg
April	16	S.S. *Balmyle*	April	23, Ridham
April	17	S.S. *Recoverer*	April	17, Penzance
April	18	S.S. *Effie Gray*	April	21, Antwerp
April	18	S.S. *Falmouth Castle*	April	20, Weston Point
April	18	S.V. *Henrietta*	April	28, Ghent
April	18	S.S. *Fanad Head*	May	11, Portland, Me.
April	19	S.S. *Snofrid*	April	23, Bo'ness
April	19	S.S. *Hild*	April	26, Noorkoping
April	19	S.S. *Sotero*	April	26, Genoa
April	19	S.V. *Marie*	May	4, Munkedal
April	19	S.V. *Fanny Crossfield*	April	27, Newcastle
April	20	S.S. *Greta*	April	27, Skien
April	20	S.S. *Woolston*	April	22, Porthoustock
April	20	S.S. *Cardigan Coast*	April	23, Plymouth
April	21	S.S. *Brier Rose*	April	27, Preston
April	21	M.V. *Anna Jensen*	April	26, Hamburg
April	21	S.S. *Walnut*	April	27, Garston
April	21	S.S. *Lowland Firth*	April	28, Rochester
April	21	S.S. *Pansy*	April	30, Preston
April	22	M.V. *Hibernia*	April	28, Leith
April	22	S.S. *Evelyn Manor*	April	30, Rouen
April	22	M.V. *Alfa*	April	30, Kotka
April	22	S.S. *Startford*	April	22, Southampton
April	22	M.V. *Hetty*	April	28, Porthleven
April	23	M.V. *Mary Peers*	*	
April	23	M.V. *Katie*	April	28, Par
April	24	S.V. *Mary Watkinson*	April	28, Charlestown
April	25	S.V. *Waterwitch*	April	27, Hayle
April	25	S.S. *Sundsborg*	May	4, Kotka
April	25	S.S. *Ualan*	April	30, Ridham
April	25	S.S. *Spinner*	May	2, Antwerp
April	26	S.S. *Moss Rose*	May	1, Fleetwood
April	28	S.V. *Olive Branch*	May	8, Runcorn
April	28	S.S. *Falmouth Castle*	May	2, Runcorn
April	30	S.S. *Weser*	May	7, Drammen
April	30	S.V. *Elaine*	*	

* in Port.

Par Harbour Shipping—April, 1923

Arrivals

Date.		Vessel's Name.	From
April	1	S.S. *Ravenscraig*	London
April	1	S.S. *T. W. Stuart*	London
April	1	S.S. *Walnut*	Dundrum
April	1	S.S. *Pamela*	Barry
April	3	S.S. *Iron Duke*	Cardiff
April	3	*J. N. R.*	Plymouth
April	4	S.S. *Camm*	Plymouth
April	6	*Lizzie Trenberth*	Mevagissey
April	9	*Fanny Crossfield*	Kingsbridge
April	9	*Lilla*	Kingsbridge
April	9	*Rhodesia*	Plymouth
April	14	S.S. *James Tennant*	Rouen
April	16	*La Revanche*	Newport
April	17	*Matilda*	Port Houstock
April	17	*Naiad*	Antwerp
April	17	*Start*	Penzance
April	17	*Lily*	Dartmouth
April	24	*Henrietta*	Mevagissey
April	24	M.V. *Regina*	Plymouth
April	26	S.S. *Seaforth*	Plymouth
April	26	S.S. *Truro Trader*	Falmouth
April	27	M.V. *Phœnix*	Plymouth
April	28	*Snowflake*	Runcorn
April	28	M.V. *Isabel*	Port Houstock
April	28	M.V. *Garlandstone*	Penzance
April	28	M.V. *Katie*	London
April	28	*Pet*	Runcorn
April	28	*Two Sisters*	Port Houstock
April	28	*Guiding Star*	Falmouth
April	28	*Confinance*	Falmouth
April	28	S.S. *Iron Duke*	Bristol
April	29	M.V. *Schwan*	Exeter
April	29	*Harry Hurbert*	Kingsale

Sailings

Date.		Vessel's Name.	Destination.
April	4	S.S. *Ravenscraig*	Guernsey
April	4	S.S. *T. W. Stuart*	Fowey
April	4	S.S. *Walnut*	Plymouth
April	5	*Pedestrian*	Antwerp
April	5	*J. N. R.*	Pentewan
April	6	S.S. *Pamela*	Newlyn
April	6	S.S. *Iron Duke*	Bristol
April	6	S.S. *Camm*	Inverkeithing
April	15	*Rosina*	Queenborough
April	15	*My Lady*	Preston
April	16	*Rhodesia*	London
April	17	*Rhoda Mary*	Runcorn
April	17	*Lizzie Trenberth*	Glasgow
April	18	*Lilla*	Ardrossan
April	18	S.S. *James Tennant*	Sunderland
April	19	*Fanny Crossfield*	Newcastle
April	20	*La Revanche*	Nantes
April	24	*Matilda*	Plymouth
April	24	*Lily*	Gravelines
April	26	M.V. *Regina*	Pentewan
April	27	S.S. *Truro Trader*	Liverpool
April	28	*Naiad*	Rochester
April	28	*Start*	Fredickshall
April	28	M.V. *Phœnix*	Pentewan
April	29	S.S. *Seaforth*	Western Point

Charlestown Shipping

Arrived.		Vessel's Name.	Sailed.	
April	1	*Fox*	April	6, Brussels
April	1	*Paie*	April	14, Gravelines
April	17	*Watchful*	April	19, Rouen
April	20	*Fox*	April	26, Brussels
March	29	*Hetty*	April	3, London
March	30	*Katie*	April	3, Rochester
April	4	*Westdale*	April	6, Preston
April	8	*Christiana*	April	12, Manchester
April	6	*Mary Ann Mandell*	April	13, Rochester
April	2	*Flying Foam*	April	13, London
April	11	*Amanda*	April	16, Preston
March	30	*Amy*	April	17, Runcorn
April	4	*Elsie Thomas*	April	19, Preston
April	20	*Norrie*	April	21, London
April	13	*Challenge*	April	25, Rochester
April	12	*Rylands*	April	28, Treport
April	15	*Spitzbergen*	April	24, Rochester

April China Clay Deliveries

Revival Maintained

THE recovery from the temporary set-back at the end of February and the beginning of March has been well maintained throughout April, which has once again restored the monthly volume of trade above the 70,000 tons mark. Although the Easter holidays intervened, April shows a total delivery of 70,546 tons, exceeding the figure in March by 9,000 tons, and in February by 10,000 tons, but over 3,000 tons below the total for January. This year's trade so far shows a substantial improvement over 1922, the total for the four months ended April being 267,236 tons against 202,939 tons for the corresponding period last year, an excess in favour of this year so far of 64,297 tons. This fine record is largely due to the continued heavy demands from America, the demands in the home markets being also fairly steady. The situation on the Ruhr is not helpful to the China Clay trade, and until things are straightened out in that part of Europe, a brisk demand is hardly to be expected. The detailed figures of deliveries for April are :—

Port.	Tons.
Fowey	57,546
Charlestown	3,700
Par	3,275
Plymouth	814
Penzance	509
Newham	248
By rail	4,454
Total	70,546

Against 50,260 tons, April 1922.

China Clay Arrivals at Antwerp

BELOW we publish particulars of arrivals of china clay in the port of Antwerp during the month of April, 1923 :

FROM			Tons	cwt.
Fowey	S.S. *Clifnore*	March 31	300	0
Fowey	S.S. *Cliffmore*	March 31	650	0
Teignmouth	M.S. *Airston*	April 1	160	0
Fowey	S.S. *Falconer*	April 3	650	0
Fowey	S.V. *Jane Slade*	April 4	211	19
Teignmouth	M.S. *Rosie*	April 5	150	0
Poole	BARGE *Solent*	April 5	180	0
Teignmouth	S.V. *Carmenta*	April 5	280	0
Fowey	S.S. *Rytoner*	April 6	490	0
Fowey	S.S. *Longston*	April 11	574	0
Poole	KETCH *Ethel Edith*	April 13	170	0
Poole	SLOOP *Glenrosa*	April 13	130	0
Teignmouth	S.V. *Concordia*	April 14	180	0
Plymouth	S.V. *M. A. James*	April 15	206	0
Par	S.V. *Martinet*	April 15	198	0
Par	S.V. *Pedestrian*	April 15	217	10
Teignmouth	M.S. *Romanie*	April 15	340	0
Fowey	S.S. *B.W. III*	April 19	480	0
Fowey	S.S. *Effie Gray*	April 24	448	0
Fowey	S.V. *Raymond*	April 26	350	0
Fowey	S.V. *Lydia Cardell*	April 26	364	0
Fowey	BRIGANTINE *Aneroid*	April 28	356	9

China Clay Import Returns

A RETURN of the registered imports of Clay-China, including Cornish or China Stone, into Great Britain and Northern Ireland from the several countries of consignment during the month of April, 1923, shows the following total :—

Countries where Consigned.	Quantity. Tons.	Value. £
Channel Islands and Total	510	765

G.W.R. and Clay Traffic

IN his monthly returns of statistics relating to commodities originating on the G.W.R., Mr. J. C. Pole gives the following figures relating to clay (including china and ball clay) : January, 82,645 ; February, 74,265. February, 1922, showed 52,711 tons.

China Clay Exports

RETURN showing the exports of Clay-China, including Cornish or China Stone. The produce of the United Kingdom from the United Kingdom to each country of destination registered during the month ended March 31, 1923 :—

Country of Destination.	Quantity. Tons.	Value. £
Sweden	935	2,493
Norway	1,560	2,028
Denmark	377	1,022
Germany	165	278
Netherlands	2,878	7,349
Belgium	3,723	7,198
France	2,620	5,865
Switzerland	43	94
Spain	1,736	6,072
Italy	1,903	4,593
United States : On the Atlantic	16,291	40,441
On the Pacific	590	1,724
Bombay, via other Ports	2,502	10,107
Victoria	1	6
New South Wales	5	27
Canada : on the Atlantic	15	88
Total	35,344	89,385

(We were unable to publish these March figures last month, but they will be of interest to readers to compare with previous months' returns. The April return will be found on page 16.)

Commercial Intelligence

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BRADES BLUE BRICKS CO., LTD., Brades, Oldbury, brick makers. £11 1s. 4d., March 15 ; and £14 8s. 6d., March 22.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

NYEWOOD BRICK AND TILE WORKS, LTD., London, S.E.—Registered April 6 (by order on terms), £4,000 mortgage, to H. Hutchinson, Coombehurst, Winscombe ; charged on Nyewood Brick and Tile Works, Harting. *£4,000. December 30, 1922.

ESPARTO PAPER MILLS, LTD., London, E.C.—Registered April 12, Trust Deed dated March 22, 1923, securing £750,000 debentures and premiums of £2 10s. per cent. ; charged on Carron Grove Paper Mills and other properties at Denny, etc., also general charge.

RICHARDS (M.) AND CO., LTD., Cardiff, paper manufacturers.—Registered April 13, £1,000 debentures ranking *pari passu* with £1,000 debentures dated January 30, 1915 ; general charge. *£1,000. December 31, 1921.

LIMEHOUSE PAPERBOARD MILLS, LTD.—Registered April 25, £20,000 debentures ; general charge. *Nil. July 4, 1922.

SANDWICH BRICK AND TILE WORKS, LTD.—Registered April 26, £850 mortgage, to J. J. Williamson, Deal, solicitor ; charged on 50, King Street, Sandwich.

London Gazette

Winding Up Petition

"BRIDGE" PAPER MILLS, LTD. A petition for winding-up was presented on May 3, and is to be heard at the Royal Courts of Justice, Strand, London, on May 29.

The China Clay Trade Review

The Official Organ of the China Clay Industry and the only Journal specially devoted to its interests. Published in the third issue of "The Chemical Age" each month.

All Editorial communications should be addressed to the Editor, "The China Clay Trade Review," Benn Brothers, Ltd., 8, Bouverie Street, London, E.C.4. All communications relating to Advertisements, Subscriptions, and other business should be sent to the Manager, "The China Clay Trade Review," at the same address. Telegrams—"Allangas, Fleet, London." Telephone—City 9852 (6 lines).

Contents

Factors in the China Clay Trade

In few other raw material producing industries have such a variety of demands to be met and needs studied as in the China Clay industry. This is due to the fact that China Clay enters into the manufacture of an innumerable number of commodities which are very different from one another by the time they reach the ultimate consumer. Not only have particular needs of particular trades to be considered, but a close study is now called for in the different needs of a particular industry.

Especially is this the case in the paper-making industry, which is responsible for the consumption of more than two-thirds of the China Clay which is dispatched from Cornwall and Devon. Paper-makers are now becoming very particular about the qualities of China Clay they use in the making and coating of various grades of paper, freeness from grit and excellence in regard to body and colour being the essential features of a good paper clay if it is to appeal to the paper-makers. It would appear from the experience that some China Clay producers have had lately that while paper-makers at home appear to be reluctant or unable to make any suitable use of the cheapest grades of China Clay, their neighbours on the Continent, especially in Belgium and France, appear to achieve success by the use of cheap clays.

The complaint of British paper-makers against the use of the cheaper grades of clay is that their mica content has a detrimental effect on their machines, but no such complaint is made by the Continental paper-makers, who are now using cheap clays in "news" to a greater extent than ever. It would therefore seem that Continental paper-makers are using machines that can be adapted so as to use cheap clays in paper-making as successfully as the better grades of clay which our home paper-makers seem to consider indispensable. It is recognised by China Clay producers that it is up to them to meet the needs of the markets they are out to supply, although to some the demands of some paper-makers as regard the mica content and the percentage of moisture in clays are considered somewhat exacting. The China Clay producers are not alarmed about it, but are bending their efforts to so refine their clays used in the paper-making trade as to render the percentage of grit negligible and to prevent the absorption of external moisture by sheeting all bulk clay from its transport from the works to the ports and railway stations.

In the various branches of the ceramic trade China Clay and china stone are used largely in earthenware, sanitary ware, china, and porcelain. Generally speaking, the China Clay suitable for paper-making and bleaching does not make a good potting clay, and, on the other hand, a good potting clay does not, generally speaking, make a good bleaching or paper clay. Capacity to stand heat at very high temperatures is the main feature looked for in potting clays, the colour in its natural state not being an essential feature as in the case of paper and bleaching clays, for frequently a potting clay with a distinctly cream or yellow colour turns out in firing to be an excellent "potter."

The third main use for China Clay as distinct from the others is that of a bleacher to impart whiteness to fabrics otherwise coarse and somewhat dark in appearance in their rough manufactured state. The British cotton mills have long since appreciated the value of China Clay as a "filler" in the cheaper classes of cotton goods, whose main object is to give hard wear. China Clay used in this way imparts strength as well as weight to the fabric, and enables the cotton manufacturer to cater for a big market like India and other countries with a large native population, who require such material for use as loin-cloths and other similar purposes.

The uses of China Clay in the chemical trades are too numerous to specify, the main characteristics looked for in this class of manufacture being ascertained by analysis, some classes of clay being more suitable than others, apart from body, freeness from grit, and percentage of moisture. Fineness of texture in China Clays for this purpose are generally sought for, and China Clay producers are showing themselves to be equally anxious to meet the needs of consumers in this branch as in others. From our experience of the producers of English China Clays we can assure all users and prospective users of this valuable raw material that they, the producers, are not in the least conservative, but are ever ready to adapt their product to suit the particular requirements of China Clay users.

International Mining Exhibition

The Mining Exhibition held in London June 1 to June 14 embraced the China Clay and quarrying interests of the county of Cornwall. China Clay was well represented by English China Clays, Ltd., John Lovering and Co., North Goonbarrow China Clay Co., Ltd., William Varcoe and Sons, Ltd., and Cornish Kaolins, Ltd. We are glad to see such representative firms of the industry exhibiting and supporting a very worthy exhibition. China Clay is admittedly a difficult material to show in an attractive form. We remember some years ago one of the largest firms showing a moving model of a claypit, made, we believe, by one of their workmen. This was quite good, and interested spectators considerably. If this idea was developed on a more elaborate scale, or by the application of the cinema film, it might do much to advertise the industry in an attractive and popular form. China Clay producers are beginning to realise the importance of propaganda, but most of them have much to learn in this respect.

The Chemistry of Colloidal China Clay

By Alfred B. Searle

This is the fourth instalment of the series of articles commenced in our March issue, dealing with colloidal clay in general and colloidal China Clay in particular.

V.

Properties of China Clay Sols

A sol may be defined as consisting of an enormous number of extremely minute particles suspended in a liquid in which they are practically insoluble. In a China Clay sol the clay is termed the dispersed phase and the water in which it is suspended is known as the disperse medium. Technically a China Clay sol is known as a *slip* or *slurry*. In a well-made sol, the particles must remain in suspension for an indefinitely long period; the author has in his possession clay sols made eleven years ago, which still show no signs of settlement. They are exceptionally stable, having been prepared under conditions which would be impracticable on a manufacturing scale. Even in the latter, however, it is not impossible to obtain clay sols which will show no signs of settlement during twelve months. A badly made sol or one which is stored in an unsuitable vessel may form a deposit in the course of a few days or even during a few hours.

The following are the chief properties of a well-made China Clay sol, containing up to 5 per cent. of clay in suspension. Much more concentrated suspensions can be prepared, but they are much less pure as the peptising agent employed enables a considerable proportion of non-plastic material to be held in suspension. These highly concentrated sols are chiefly used for casting large pieces of ware which are difficult to make by any other process. Owing to the grog, sand, etc., purposely added to them, their properties are very different from those of sols composed solely of China Clay.

1. *The two-phase nature* of all sols is probably one of their most important characteristics. The existence of the minute "solid" particles suspended in the liquid must be fairly obvious from the manner in which clay sols can be prepared by a purely mechanical process such as grinding and by the opacity of the fluid, but their existence is still more clearly shown if a powerful beam of light is projected through it. The separate particles each disperse the light and produce an appearance resembling motes in a sunbeam.

The active motion of colloidal particles was first investigated by a botanist (Brown) in 1828, from whose name it is usually known as the Brownian movement. It has been shown by Govy, Perrim and others to be due to the bombardment of the particles by the "molecules" of the liquid, as the latter are far too small to be seen, even with an ultra-microscope, only the colloidal particles appear to move. According to Zsigmondy,* particles larger than 0·00015 in. show no perceptible Brownian movement and that active motion is confined to particles less than 0·000004 in. in diameter.

Such small particles will remain in suspension indefinitely so long as they do not coalesce. They are usually prevented from coalescing by the possession of an electric charge which makes them mutually repulsive to other particles of the same substance. If, however, an active colloidal particle approaches very closely to another one bearing an electric charge of the opposite sign, the two will be mutually attracted and will form a correspondingly larger particle which will sink at, roughly, four times the rate of either particle.

The presence of "solid" particles in actual suspension as distinct from being in solution is also shown by passing a clay sol through a special or ultra-filter composed of collodion, the pores of which are too small to allow suspended matter to pass, whilst matter in true solution passes readily. Unfortunately, these filters can only be used on a small scale and so are impracticable for separating large quantities of colloidal clay sols from coarser particles in suspension, but they are useful for demonstrating the sizes of the colloidal particles and for preparing small quantities of superfine sols for investigational purposes.

2. The *colour* of clay sols is milk white by reflected light, but brown by transmitted light, as in the latter case the suspended particles disperse the light and so produce a shadow effect. Clay sols do not show the beautiful colours possessed by sols of many of the metals.

3. The *osmotic pressure* (or force exercised on a diaphragm which forms part of a vessel immersed in the sol) is very small. The osmotic pressure of a true solution has a definite relation to the molecular weight of the dissolved substance, but as sols are not true solutions, this relationship does not apply to them. Failure to recognise this has led to foolish statements as to the enormous molecular weights of some colloids.

4. The *diffusivity* of colloidal sols is the rate at which they will pass through a membrane and into a fluid contained on the other side of it. Substances in true solution pass readily through such a diaphragm, but colloidal sols go through so slowly as to make their diffusivity almost zero. This property is used in the process of dialysis to separate any soluble salts present in a colloidal sol, but this is never attempted on a large scale with clay sols.

5. The *specific gravity* or density of a colloidal sol is directly related to the proportion of colloid present.

6. The *surface tension* of a colloidal clay sol is lower than that of water, but this subject requires further investigation.

7. The *viscosity* of clay sols is that force which prevents them from flowing as freely as water through a small orifice. It appears to depend on the total volume of the clay present and not on the size of the particles, but it must also be affected by the thickness of the film of adsorbed liquid around each dispersed particle and on the arrangement of the particles relative to each other. Owing to their viscosity colloidal clay sols do not show any sharp line of demarcation when allowed to rest. The upper part of a crude clay sol remains cloudy and there may be a sharply defined deposit of non-colloidal matter at the bottom of the vessel. If a still coarser and more concentrated suspension is allowed to stand the larger particles interfere with the smaller ones and drag them down. Free has found that this interference is serious in suspensions containing more than 9 per cent. of China Clay.

Unfortunately, very little is known about the viscosity of China Clay sols beyond the fact that it is increased by the addition of sulphates and by such other substances as calcium chloride, ammonium chloride, and humic acid, and that it is reduced by sodium chloride, sodium phosphate, sodium silicate, and hydrochloric acid. Alkalies and soluble carbonates in small proportions make a clay sol thinner, but in large proportions they make it more viscous. Some sulphates behave abnormally, thickening or thinning the sol according to the proportion present. Thus sodium sulphate when less than 0·1 per cent. is present thickens the sol; when 0·1 to 1 per cent. is present the sol is thinned, and still larger proportions cause it to thicken again. These changes have not been fully investigated.

8. The *electrical properties* of China Clay sols are important. Each suspended particle behaves as though it bore a negative electric charge. As a result of this the suspended colloidal particles possess the following properties:—

(*a*) If an electric current is passed through a sol the clay particles will be carried toward one of the electrodes (the anode), whilst any particles bearing an opposite charge will be carried towards the other electrode (the cathode). The rate at which the particles travel is similar to that of the ions in a true solution. This transfer of "solid" particles under the influence of an electric current is known as *kataphoresis* and is highly characteristic of all colloidal sols and of certain soluble substances (electrolytes). It distinguishes colloids from inactive suspensions, but not from matter in true solution.

(*b*) If a clay sol is contained in a vessel in which a porous pot or diaphragm is partly immersed and an electric current is passed in such a manner as to transport the clay particles towards the anode on the interior of the porous pot, or on the further side of the diaphragm, or if the diaphragm itself forms one electrode, the clay will be deposited on the anode, but the water most intimately associated with it will pass to the

* Kolloid chemie, 1912, p. 18.

cathode, so that the clay and water are separated. This separation is known as *electro-osmose*. Wiedemann * has shown that the quantity of water passed through the diaphragm is directly proportional to the current, if the diaphragm is kept clean, and is independent of the area of the diaphragm, and that the difference in level of the liquid on each side of the diaphragm is also proportional to the current and independent of the size of the diaphragm. The various patents granted to Schwerin and his associates are based on this method of separating the clay from its suspension. The commercial value of such a process depends on its cost as compared, for example, with that of removing the water by evaporation or by flocculating the clay particles, allowing them to settle and afterwards deflocculating them in the presence of a smaller quantity of water.

(*c*) The electrical conductivity of a clay sol is greater than that of water, but much less than that of true solutions of silicic acid and aluminium chloride containing the same quantity of silica and alumina, but very little effective work has yet been done on the conductivity of clay sols.

(*d*) If to a sol containing electro-negatively charged particles of clay is added a sol containing electro-positively charged particles of any kind, the two sets of particles will be mutually attractive and will coalesce, forming a precipitate which will settle fairly rapidly. The same will occur if positively-charged ions are introduced into the clay sol. Hence, clay sols are destroyed by the addition of any substance which contains or can produce particles bearing electro-positive charges. The presence of electro-negative charges in the added substance appears to have no effect, so that clay sols are destroyed by the addition of almost any salt or mineral acid, the clay being precipitated in a flocculant form.

9. The *stability of clay sols* is very slight unless special precautions are taken to increase it. Thus, as explained in the preceding section, the addition of almost any salt or acid, or a colloid of opposite sign will destroy the sol by causing the clay particles to coalesce and form a flocculent precipitate. If the amount of salt or positive ions added is just sufficient for the positive charge on its particles to neutralise the charge on the clay and on any other negatively charged particles, the clay will be precipitated; but if a further quantity of the precipitant be added the sol may be reformed, because it will then be stabilised by the selective adsorbtion of an ion of opposite sign. Hence, the quantity of a precipitant added may determine whether the stability of a sol is increased or destroyed.

As long ago as 1871, Schloesing showed that the formation of deltas is due to the precipitation of the clay sol by the salt in the sea water at the mouth of the river.

The amount of one sol necessary to precipitate another varies with the degree of adsorption in each case and cannot be predicted unless the specific properties of both sols are fully known.

As any particle having a positive sign will precipitate a clay sol, it is possible by this means to obtain precipitates of clay and alumina or of silica and alumina which can be re-peptized without change in composition and show many evidences of being compounds, though they are only mutually adsorbed colloids with no definite chemical combination. It has been suggested that some clays and siliceous bauxites are of this character, and are not the definite chemical compounds which is usually assumed.

A clay sol may be stabilised in various ways according to the purpose for which it is to be used. That is to say, some methods of stabilisation may be satisfactory in themselves, but cannot be used in some cases because of the adverse effect of the stabilising agent on some other material with which the sol is brought into contact.

The following are the chief methods of stabilising clay sols :—

(*a*) *By means of an ion which is readily adsorbed from a salt.* Clay sols are specially sensitive to soluble substances (electrolytes) with a readily adsorbed positive ion—*i.e.*, one of the opposite sign to the colloidal clay, unless the sols have been prepared in the presence of a salt containing the same ion, in which case they are largely insensitive. Thus, if a sol is required to be mixed with a saline solution, it should be prepared with such a saline solution instead of with plain water; the sol will then be stable in the presence of the corresponding ions of the salt.

If the amounts of various ions required to precipitate a given weight of clay in the sol state are arranged in consecutive order and the tests are repeated with a clay sol prepared in the presence of a definite quantity of salt, the order in the two series will be quite different as in the latter case there is an adsorption of the electrically neutral salt as well as of the precipitating ion. If the adsorption of the salt is selective—as is usually the case—it may entirely alter the precipitating power of any ion.

It is commonly stated that the di-, bi- and tetravalent ions have a greater precipitating power (*i.e.*, they are adsorbed more readily), than the monovalent ions, but there are so many exceptions that such a statement should be accepted with reserve.

It is noteworthy that whilst clay is peptized by caustic soda or ammonia, yet the sol is precipitated by barium hydroxide because of the strong adsorption of the alkaline earth kation. It is also precipitated by alum and by basic dyes.

When a clay sol is stabilised by an electrical charge, the amount of salt requisite to precipitate it depends partly on the manner in which it is added, more being required if it is added slowly.

(*b*) *By increasing the temperature*, provided this also increases the peptising action of the disperse medium. If, however, the increase of temperature reduces the adsorption of the stabilising ion, or if there is no excess of peptising agent, the stability of the sol will be reduced.

(*c*) *By means of a second colloid.* Clay sols of exceptional stability are obtained by preparing them in the presence of such colloids as gelatin or peptone, which exercise a strongly protective action against most precipitating and flocculating agents. Unfortunately, the most suitable of the added colloids are chiefly of an organic nature, and interfere with some purposes for which China Clay is used. Where this objection does not apply, such colloids are among the most powerful stabilising agents. On the other hand, as pointed out by Schulze in 1866, very small proportions of gelatin solution added to a clay sol will precipitate the clay as effectively as any well-known precipitant such as lime or alum. A larger proportion of gelatin, especially if it is present when the sol is being prepared, has the powerful stabilising effect previously noted. Graham had previously (1862) observed that gelatin had the same effect on silicic acid, the composition of the precipitate containing a variable proportion (36–43 per cent.) of gelatin.

One of the great advantages of gelatin as a stabilising agent is that sols in which it is present can be evaporated to dryness without being spoiled; when a suitable quantity of water is added to them, they are completely restored to their original state. When an unstabilised sol or one with a feeble stabilising agent is evaporated and afterwards redissovled, the new "solution" seldom contains more than 80 per cent. of active colloid, and is often almost devoid of this material.

Unfortunately, protective colloids such as gelatin are seldom applicable to China Clay, as they tend to undergo decomposition on exposure to air, and when heated to redness they tend to produce serious defects in the ware. Their cost is also objectionable except for special purposes.

It will be seen from the foregoing that when China Clay is subjected to a peptising process such as is used in the preparation of colloids, the resulting liquid has all the properties of a colloidal sol and responds to all the reactions of such a substance. The manner in which it is peptised has an important influence on the properties and particularly on the stability of the sol.

Clay sols are so bulky that they are inconvenient and costly to transport. It is therefore preferable to concentrate them as much as possible without destroying their characteristic properties. This can be done by (i) electro-osmose, (ii) evaporation to dryness under suitable conditions, and (iii) by precipitating the clay under such conditions that a readily reversible gel is produced. It is easy to form a clay gel, but by no means so easy to produce one which can be readily and completely restored to its original (sol) state in a simple manner.

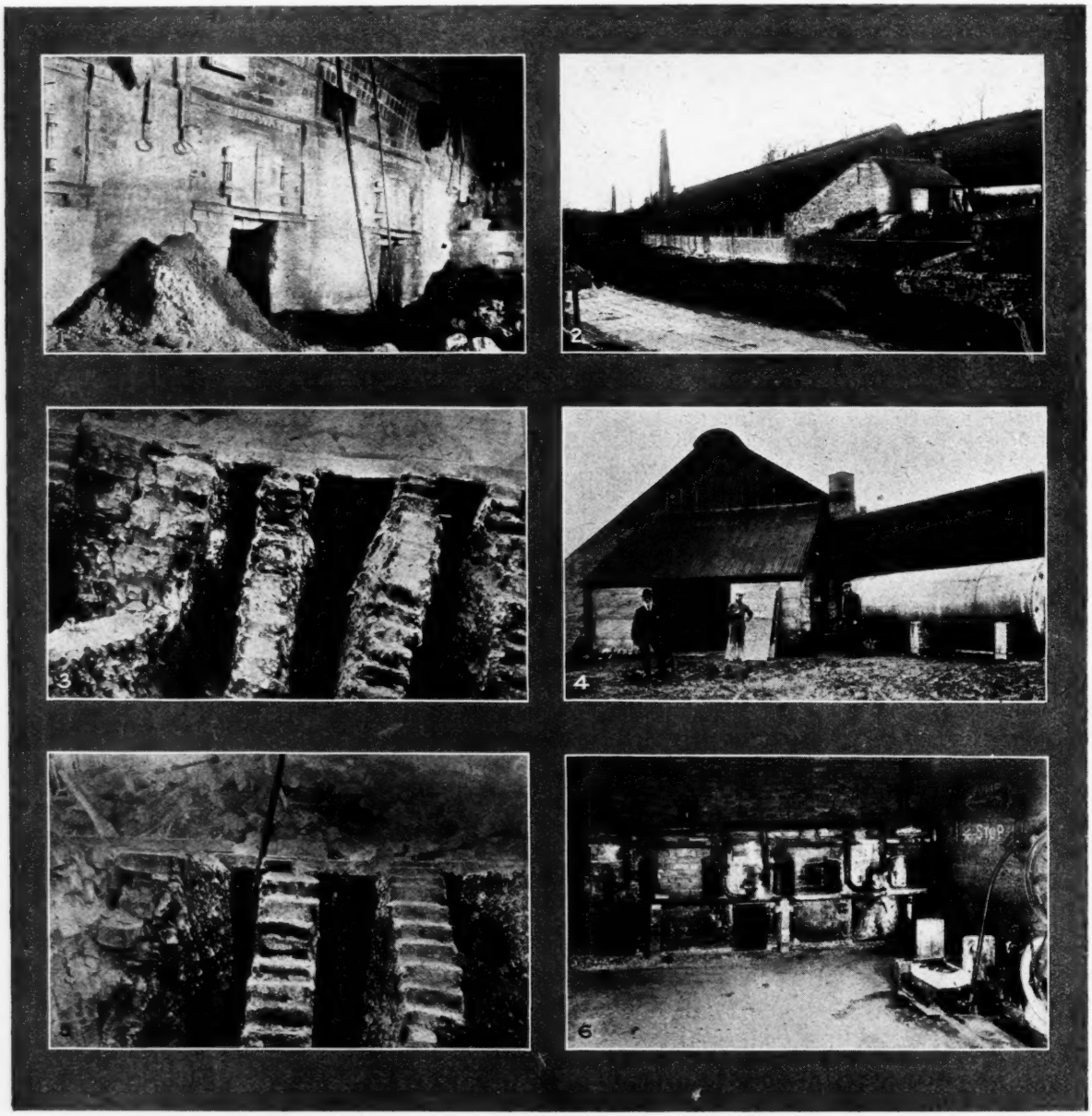
* Pogg. Ann. 1852, 87, 321; 1856, 99, 177.

Oil Fuel for Clay Drying

Remarkable Results with Mex Fuel Oil

As all who are acquainted with the costs involved in the production of China Clay are aware, that of coal for drying purposes is one of the heaviest that China Clay producers have to meet. Before the war, when coal for drying purposes could be purchased for less than a pound a ton, China Clay producers were not so keenly interested in reducing costs under this head as they are now that drying coal is costing well over 40s. per ton at the China Clay works. In the old days buyers were not so particular about the clay being bone dry, so that it was possible to average over 12 tons of clay dried per ton of coal, but nowadays, when purchasers are more particular, it would not average more than 10 tons of clay per ton of coal.

It will, therefore, be seen that any new method by which China Clay can be dried more economically is a matter of great importance to China Clay producers, whose drying costs are now so heavy.



OIL AND COAL KILNS

1. Front of furnace using coal.
2. Exterior of kiln using oil. Note absence of smoke.
3. Flues distorted through irregular coal firing.
4. The oil tank.
5. Another view of coal distorted flues. No distortion with oil.
6. Front of furnace using oil.

In this connection, the experiments that have been carried out for over six months with Shell-Mex oil fuel at Great Hallaze China Clay Co.'s dry at Par, Cornwall, have aroused great interest in China Clay circles, the success of which is

diverting the attention of producers to the use of this fuel instead of coal in the near future.

When it is stated that the drying capacity with oil fuel is 156 per cent. over that of coal, and the drying cost 93d. per ton of clay dried compared with 102·58d. in the case of coal, it will be seen what a tremendous advantage there is in favour of oil. Other advantages are that the clay can be placed on the pan in a very much thinner condition, and that clay can be dried very much more quickly, without in any way affecting the quality of the clay when dried. Transportation costs with oil are slight compared with those of coal, it being possible to pump supplies from the oil reservoir to whereever it is required at a very slight cost. The labour costs in connection with fueling with oil are much lower than those involved in coal firing, the stoking of fires and the removal of "clinkers" and ashes being cut out. Under the heading of storage there is also great economy possible, inasmuch as reserves of oil can be kept in tanks in the open, whereas with coal a good deal of space and shelter is required. Under the heading of wear and tear, the costs in the upkeep of the furnace are practically nil with the use of oil, whereas frequent repairs are necessary with the use of coal, an item being the renewal of fire-bars. Another drawback with the use of coal which is overcome by the use of oil is that the flues do not become clogged up with soot, which necessitates the dry being stopped occasionally to clean out the flues.

All these advantages have been proved with great satisfaction by Mr. Sellick, the manager of Great Hallaze China Clay Works as the result of the use of this new fuel on a practical basis. The success achieved is all the more interesting because it has demonstrated the ease with which the apparatus necessary can be adapted to existing coal furnaces, which can be easily re-converted for the use of coal if necessary. If in the future the use of oil fuel is generally adopted by China Clay producers in the drying of clay, it will be an advantage for the furnace end of the dry to be constructed for this purpose.

What must appeal to China Clay producers in the adoption of the use of oil fuel is the simplicity of the apparatus necessary to make it effective. This is what immediately impresses itself upon one when seeing the plant in use at Great Hallaze dry. All that is needed in the way of machinery is a small 5 to 6 h.p. oil engine to drive the fan that provides the necessary pressure of air which passes along a 6 in. iron pipe, with an outlet at the junction of the oil feed. A second run of iron pipe conveys the oil from the feeding tank to the oil burner from which the atomised liquid fuel emerges intermingled with the air from the fan. The principle of the mechanism for producing and projecting the flame is that of the blow-lamp used by painters for removing old paint from wood and iron work. At Great Hallaze three of these blow-lamp jets, known as Rotamisor burners, are used, one being inserted in the centre opening of the furnace, which supplies the heat to the three centre flues, and one in each of the other two openings supplying the heat to each set of four side flues, which, for the sake of the uninitiated, it may be stated, run the whole length of the dry under the pan upon which the clay to be dried is deposited.

Only one tank is necessary between the main oil storage tanks and the furnace, this being the tank which by gravity feeds the pipe leading to the jets, which is also used for reducing the oil by heat to the proper consistency before entering the burners. The distribution of the heat in the flues is regulated by means of simple dampers, which may be opened or shut according to whether more or less heat is required at the furnace end or the extreme end of the dry.

One of the greatest advantages of this oil fuel is the saving of time in getting the dry up to the required heat for drying clay after first lighting up. For instance, at Hallaze dry with the use of oil fuel the dry has been ready to dry clay by 7 o'clock in the morning after the jets had been started at 4 o'clock the previous afternoon. The pan of Great Hallaze dry is 230 ft. long by 16·6 in. wide. At intervals of about 40 ft. for the length of the pan tubes have been inserted to ascertain the temperature, and these have recorded as much as 1150° C. at the furnace end and 250° C. at the extreme end of the dry. Minimum temperatures of 430° C. and 50° C. have also been recorded, and any intermediate temperatures are obtainable at will. I had a chat with the man in charge of the dry, and he was very emphatic in giving his opinion in favour of oil fuel, which he said not only dried clay well but dried it quickly. They had tested this by putting clay on the pan in a very liquid state and had it dried very much quicker than with the use of coal.

He had placed clay on the pan to a thickness of from 6 to 9 inches, and it had been dried sufficiently to throw out into the linhay within nine hours from the furnace end of the dry, whereas it would have required at least a day with coal; and at the extreme end of the dry he had been able to throw out every other day, whereas with coal it would have taken three or four days. Oil fuel, so far as it was concerned in the drying of clay properly and quickly, he had found a complete success.

No amount of explanation in cold print as to the method in which oil fuel is utilised for use in clay drying can be so explanatory as an inspection of the apparatus in actual use. Its simplicity and the ease with which it can be utilised are all factors which will instantly appeal to all China Clay producers, who have always been somewhat conservative in the use of complicated machinery in China Clay production. Already the success of the experiments at Great Hallaze China Clay Works with the Shell-Mex oil fuel has spread, as a result of which other China Clay producers are seriously contemplating the introduction of this fuel into their dries. Undoubtedly it will be of tremendous advantage to those firms who are frequently called upon for delivery of certain particular grades of clay at short notice because, if necessary, it is possible with the oil fuel to turn out China Clay in a dried state within a few days of its production at the pits, whereas with the use of coal fuel it is not possible to do this under two weeks at least.

The inclusive cost of installing the plant for the use of oil fuel is approximately £500 per kiln. With it a more even heat is obtained than with coal, and though an intense heat can be produced by it, the clay is not burnt if removed from the pan as soon as it is dried the same as in the case of coal.

The main reason why the use of this fuel should appeal to China Clay producers is its economical handling and the great saving effected in the cost per ton of dried clay over that of coal. With that fact established there is likely to be a revolution in the economical production of China Clay.

Brisk Demand for China Clay

The Western Morning News says:—It is very gratifying to learn from the periodical export returns that the China Clay trade is fast recovering its pre-war prosperity. The increase in tonnage reported this year as compared with last is very remarkable, and the most satisfactory feature in connection with it is that it is not a sudden fluctuation, but appears to be the outcome of a steady growth in the demand not only from America, but from European countries as well. The home market, too, is displaying a welcome briskness. To some extent this is no doubt due to the settlement of the question as to the Producers' Association, which has tended to clear the atmosphere of business, and to reassure buyers as to the future prospects of the trade. Nothing is more disturbing in business than uncertainty as to the future conditions of trade, and now that the China Clay producers have settled down to a duly regulated system of trading, the prospects of the industry seem once more bright.

English Producers' Advantages

HITHERTO the principal markets for China Clay have been Canada, the United States, France, Belgium, the Scandinavian countries, the Netherlands, Italy, Spain, India, and to a less extent South American countries, including Brazil. Formerly Australia and South Africa imported manufactured products into which China Clay enters as a raw material; but now they have their own manufacturing industries. They are more or less dependent upon imported raw materials, and look to Great Britain for supplies, says *The Times* (Trade Supplement). Demands for this important commodity increase, and although kaolin deposits have been discovered in foreign countries, threatening competition, Great Britain possesses the advantage of extensive seaboard with ready access to valuable overseas markets where purchasers are likely to be influenced by the special qualities of the English product.

China Clay Notes and News

China Clay Works Development

We understand the Great Halviggan China Clay Co. are erecting a large dry at Brungullow station—one station west of St. Austell—where there have been for many years a very long range of China Clay kilns alongside the main line of the Great Western Railway, which must have arrested the attention of thousands of visitors to the Cornish Riviera. This is one of the features of the developments recently decided upon by the progressive board of directors of this firm, and when completed will be connected to the works by pipe line. The new kiln will cost little if any less than £15,000; but it is bound to effect a great saving, as the cartage from Halviggan Clay Works to St. Austell station is about 5s. per ton. In addition to providing employment it will divert a large quantity of China Clay from the roads, and particularly from the congested streets of the town of St. Austell. These developments are being carried out under the direction of the local managing director, Mr. Hart-Nicholls, and are proceeding very satisfactorily.

Mr. Rose and the Historical Association

A large and representative gathering of the Truro Branch of the Historical Association recently participated in their annual spring excursion. Leaving the city on a delightful morning, they proceeded through the beautiful Ladock Valley to "Castle-au-Dinas," a commanding altitude with some interesting historic associations. The company resuming their journey made for Bugle, and here they were entertained to luncheon by Mr. and Mrs. Rose. During an interval, Mr. Rose —who is the principal of the firm of Messrs. North and Rose, of St. Austell—gave a short but a most interesting account of the many uses of China Clay, and later in the afternoon Mr. Rose conducted the party over the well-known Rocks China Clay Works and explained the various stages of China Clay production. The works, which belong to Messrs. North and Rose, are amongst the best equipped mines in the neighbourhood, were much admired by the distinguished visitors, and thanks were expressed to both Mr. and Mrs. Rose for the pleasure they had given them on that occasion.

Gas Explosion at Offices

The shipping offices of the English China Clays, Ltd., at Fowey, very narrowly escaped demolition by an unusual explosion last month. It appears that on the arrival of Mr. A. H. Wyatt one morning a serious leak of gas was detected and almost immediately became ignited, followed by a terrific explosion. The inner room was practically wrecked, glass, furniture and papers being strewn in all directions. The door communicating with another room was shattered, as well as the outer door leading into the street, and glass, etc., being scattered for several yards on the road. Mr. Wyatt, who was in the inner room, was badly shaken and slightly burnt, and his assistant was also burnt about the face, and they were obliged to have medical assistance before they could proceed to their homes. A representative of the colliery offices opposite was proceeding into Mr. Wyatt's offices at the time of the explosion and was blown into the street by the force of the impact and received injuries which necessitated his removal to the local hospital.

China Clay "Captain's" Death

The death of Captain J. Rabey, which occurred at his residence recently at Penisker, St. Mewan, has bereft the district of a familiar personality and the China Clay industry one of its leading supervisors. For several years past Captain Rabey had been identified with the Great Halviggan China Clay Works, and was held in very high esteem by the board of directors, and also by the men engaged on the works. Throughout his illness, which was of a few weeks' duration, much concern was manifested in the locality and his death has evoked widespread sympathy with the bereaved family.

The funeral, which took place at St. Mewan, was very largely attended, and the impressive obsequies were performed by the Rector (Rev. A. D. Limbrick). The coffin, which was covered with beautiful floral tributes, was borne by the oldest employees from the Great Halviggan Clay Works (Messrs. Andrew Pearce, Alfred Tonkyn, W. Hawkey, J. Venner, Harry Stone, W. Bartlett), assisted by members of the Trethosa and St. Austell Tents of the Independent Order of Rechabites.

Tribute to China Clay Workers

At a recent Chamber of Commerce dinner at St. Austell the Hon. H. D. McLaren, C.B.E., and also Mr. Higman, paid high tribute to the character and reputation of the China Clay workers. The *St. Austell Guardian*, in its report of these speeches, says :—" It is one thing to deserve appreciation and another to have it publicly acknowledged in the unstinting manner in which two of the leaders of the industry, who have had many years' intimate experience with the workers, did last week. It is because the employers realise that they have a capable, conscientious body of men co-operating with them to make the industry prosperous that they are desirous of maintaining wages at their present level as long as possible. Now that the continuation of the Association is assured and the trade outlook is good, there is no intention of interfering with the present rates of wages.

The Discovery of the Secret of Hard Porcelain in Europe

About the commencement of the eighteenth century (1709) a native of Saxony while out riding noticed that his horse was hampered in its movements whilst travelling over a patch of a whitish clayey earth. When he examined the ground more closely he found that the chief part of this earth was unctuous to touch and easily reduced to a fine permanent powder. It seemed to him to be a likely material to make powder for wigs, instead of the wheat flour hitherto used, and he adopted it for this purpose. Now it happened that the Elector of Saxony had a long time previously commissioned Böttger to investigate the methods for making porcelain. Finding that the wig he wore was heavier than usual Böttger made inquiries to ascertain what this new substance was employed to weight wigs. He was informed that it consisted of a plastic terreous substance, and, having obtained some samples, he made experiment after experiment, with a view to porcelain manufacture. Thus he quickly found to his great joy that he could now meet the wishes of the Elector. This wig powder, in fact, was nothing else than kaolin—viz., porcelain clay. Thus Saxony was the first to present a hard porcelain to Europe, and it is yet manufactured in the country. Fifty or sixty years later a rich kaolin deposit was discovered at St. Yrieix, near Limoges, which enabled France to rival Saxony in nature of the product and excel from the point of view of art and industry. After those of China and Japan, the chief kaolin deposits are in Cornwall and Devonshire, St. Yrieix (France), the valley of Aue (Saxony), Passau (Bavaria), Chiesi (Italy), etc. The oldest European hard porcelain was made with Aue kaolin (Saxony) and for the first time in France with the kaolin of St. Yrieix.—*Translated from a French encyclopædia.*

American Visitors

Mr. F. Westlake, President of the Perkins Goodwin Paper Co., New York, has been on a visit to this country and the Continent. He was accompanied by Mr. S. Goldman, President of English China Clay Sales Corporation, New York. Mr. Goldman is recovering from a rather severe illness, and we were glad to see him looking so much better. We are afraid our English climate in May of this year has not met with the approval of either gentleman. In spite of this we believe they have enjoyed their visit to the Old Country and have renewed many old friendships.

Ceramic Society in Dorset

The Refractory Material Section of the Ceramic Society held their twelfth annual meeting at the Town Hall, Bournemouth, early in May, and on the afternoon of the first day visited the Ball Clay Works of Messrs. Pike Bros., Wareham, and much appreciated the privilege of seeing where and how the clays in question are won and handled.

China Clay Co. For Sale

The Times advertisement columns of June 4 contain the following :—

China Clay.—As a going concern the entire assets of a company in the St. Austell district, producing a well-known brand. Cash price, £8,500. The assets include valuable 56 years' lease on exceptionally favourable terms; also plant and machinery. The company's product commands a ready sale. Fullest investigations invited and resident director in Cornwall will supply information.

The Microscopical Examination of China Clay

Extracts from a Paper read at Royal Microscopical Society, May 30.

By Jos. M. Coon, of St. Austell

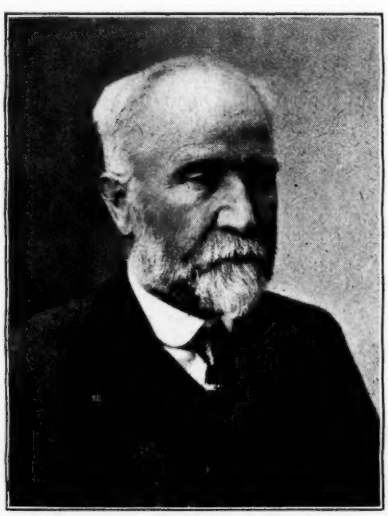
CHINA Clay, so extensively used in the arts, has been submitted to much research. Mechanical analysis by elutriation is widely practised, and properly carried out is most valuable, but I am personally of opinion that for the elutriation to be of value it must be supplemented by a microscopical examination.

I believe an hour with the microscope is as good as a day with the elutriator and will yield quite as reliable results.

The microscope, intelligently used, tells us precisely what minerals are present and their dimensions, and reveals the condition of the kaolin, and enables one to form some idea of the relative proportions. Used with a grading elutriator it is even more valuable

How to Use the Microscope

The general examination can be made in water but I prefer castor oil as a medium. Canada balsam can be used, but it



MR. J. M. COON.

does not yield such high relief as the difference in refractive index is less.

One or two milligrams of the Clay and a drop or two of water should be placed on a slip, allowed to stand for a few minutes, and then carefully mixed, preferably not spreading over a greater area than it is intended to examine, as any coarser particles which get outside will probably remain there. If castor oil is used as the medium, the slide must be dried first.

After a rapid search of the slide, with a 1 in. objective to gain a general idea of the minerals present and their dimensions, a ½ in. objective and × 8 or × 10 eye-piece may be used. It will be necessary to have at hand a quartz wedge and selenite plate giving red of the first order.

Kaolinite.—By transmitted light the crystals are water white, by reflected light in masses they are white and lustrous. China Clay contains at least 90 per cent. of kaolinite, in all probability, but the crystal faces are rarely, if ever, seen. So one has to recognise it by experience and the application of optical tests for form, colour, behaviour, in plain and polarised light and with the help of the quartz wedge and the selenite plate. In some samples of China Clay—usually fine and plastic ones—vermicules are plentiful, separated and in short lengths. As these vermicules are an alteration product, optical properties do not conform precisely to those of kaolinite, but when their crystal orientation can be determined they agree so closely as to be within the usual errors of observation for such minute crystals. Extinction will usually appear to be parallel to the basal cleavage but the small angle of difference is difficult to determine exactly with such short lengths to compare.

Muscovite Mica.—This mineral is frequently in larger flakes than kaolin. Immersed in oil of kaolin index it is white or very light yellow.

Quartz.—This is one of the most difficult of the associated minerals to diagnose. In polarised light it can generally be detected by usual methods.

Tourmaline.—Is always in evidence, shape, colour, fracture rendering it easily recognisable.

Zircon.—Colour relief, and birefringence are reliable, distinguishable characters.

Topaz.—Is another possible accompanist of China Clay, but is extremely rare. It is readily distinguished by its high relief.

Mr. J. M. Coon, in his lecture, purposely dealt very briefly with all other minerals than kaolin, because of the subject of the other papers arranged for the same evening.

At the conclusion of Mr. Coon's address, Prof. Hutchinson opened the discussion by some appropriate and valuable remarks, and expressed high appreciation of Mr. Coon's address.

Rubber Latex Paper

IN an article on the above subject, the *Investor's Chronicle* states that Mr. A. R. Kaye, the inventor of the process for making rubber latex paper, informed its representative that so far efforts have been mainly concentrated upon convincing the British paper industry with regard to the utility of latex in producing stronger and superior paper for all commercial purposes, or, alternatively, equally good paper as cheaply or cheaper by the substitution of latex for some of the other constituents, such as sulphite, now required in paper manufacture. Mr. Kaye has been much impressed by the willingness that the trade has shown to welcome his new ideas. He claims that paper can be considerably improved by such small amounts of latex as to give a rubber content of 1, 2 or 5 per cent., but as the quantity of latex used is increased, the effect upon the quality of the paper is increased, although not continuously in the same direction. There have been practical commercial tests in many mills, and these have shown that all grades and qualities of paper can be improved in some regard by the use of rubber latex. Writing and printing papers of different qualities are now being made and are already in public use. In some cases improvement in quality is marked, in others this may not be so noticeable, as the manufacturer may prefer to utilise the latex to cheapen producing cost. An important point in favour of the Kaye process is that this does not alter the ordinary process of paper-making. No new machinery is required. All that is necessary, according to Mr. Kaye, is to add the latex and the unique qualities of the rubber reveal themselves.

Considerable experimentation is being still given to finding the best method of preservation of the latex. Mr. Kaye has hitherto found that ammonia-preserved latex is best for paper-making, because the latex remains more perfectly fluid. He has had 1,250 gallons of latex from Malaya. It has all arrived in splendid condition and has been used in many mills in Britain, America, Holland and Belgium. The latex consisted of 1,000 gallons of fresh, good quality latex containing about 35 per cent. rubber, to which was added 250 gallons of water containing, or to which had been added, 43 gallons of strong ammonia. The latex as delivered here contained approximately 30 per cent. of rubber and 3 or 3·5 per cent. of commercial ammonia. This Mr. Kaye regards as a safe amount for the complete preservation of the latex.

Industrial and Trade Reports

(From our Own Correspondents and Other Sources)

Great Britain

Home Paper and Pottery Trade.

The prominent characteristics in the paper and print markets to-day are constituted by what we may term a general grievance against price and a general uncertainty as to its tend ncy. The pulp mills are dissatisfied with the present level of pulp prices, high though it is in comparison with last year's figures. The papermakers look askance at pulp prices and hardly consider them justified. At the same time it is held that paper prices are operating on a losing basis, and if the situation is to be saved an immediate general advance is held to be absolutely essential. Printers cannot conceive the possibility of higher paper prices, and withhold their stock commitments in hopes of a lower price level coming into force. If we pursue the subject further, we come to the consumer of paper and print who finds printing too costly a proposition for much indulgence. If the postal and traffic concessions are to be counteracted by advancing the costs of printing then there is an end to the hopes of trade improvement.—*World Paper Trade Review.*

After anxious and critical times in the potteries during the months of March and April, there has been a period of comparative calm during May. With the labour dispute settled and out of the way there has been a disposition—everywhere apparent—to get down seriously to work. This would have been a much easier matter had there been anything like a weight of orders on the manufacturers' books, but from the information we have been able to elicit, nowhere in the potteries is there a manufacturer who can say with confidence that he has orders in hand sufficient to tide the workers over from now until the Wakes. Everywhere the business that is being done is of a hand-to-mouth kind. But perhaps the worst feature of all is the unprecedented tightness of money. One manufacturer told the writer in the course of a chat recently that never before has he experienced such long-windedness in the settlement of his accounts. In some cases customers who could be relied upon almost implicitly to pay their accounts at a month have unaccountably failed to meet their engagements when due. This is reflecting itself in turn upon the accounts of the suppliers of raw materials, with the result that travellers for all sorts of commodities used by pottery manufacturers are complaining that, whilst business is only moderate, they are quite busy—endeavouring to collect accounts. And yet, in spite of this, employment in the potteries seems to be better in general than it has been for some time past.—*The Pottery Gazette.*

English China Clay Prices.

China Clay, in bulk, f.o.b. Cornwall, 28s. 9d. to 71s. (highest grade) per ton. The extra charges (including filling) per ton for bags and casks are:—Single bags, 9s. 6d.; double bags, 16s. 6d.; half-ton casks, 19s. 6d.; quarter-ton casks, 22s. 6d., in casks, with extra iron hoops, 2s. per ton more.

United States of America

Conditions in the United States.

While general business conditions in the States remain very fair, some of the paper manufacturers are now looking for a lull in their activities; some of the larger mills are getting ahead of their orders, and new business will be lighter. Of a consequence there should be less raw materials needed for part of the summer, and in this case the demand for China Clay would slow down proportionately. However, the clay importers hope that with the aid of the potting and other industries the normal tonnage of China Clay may be kept moving.

A rumour spread by a news agency lately has it that production of English clay is to be curtailed to the end that better prices may be obtained; a control somewhat like that of British rubber. Needless to say such a plan would be of advantage to the American clay producer, directly encouraging the domestic production.

English clay, ex steamer, per ton	14.00 to 20.00
Domestic clay, washed, per ton	8.00 to 10,00
Domestic clay, unwashed—No. 1 per ton	6.00 to 7.20
No. 2	5.00 to 6.00

Felspar in West Australia.

The Assistant State Mining Engineer for West Australia has submitted a report on the felspar deposit recently discovered in the Beverley district. Dealing with the locality and general geology of the deposit, he says the felspar occurs as the chief constituent of a big pegmatite dyke situated a little more than three miles to the south-west of Jacob's Well, where the pegmatite can be seen outcropping for a distance of about 300 ft., when its further continuation is obscured by surface soil. A sample of the felspar was examined, and gave the following results:—Total potash, 10·14 per cent.; soda, 4·56 per cent.; ferric oxide, 12 per cent.; orthoclose, silicate of potassium, and aluminium, 59·94 per cent.; albite, silicate of sodium and aluminium, 38·58 per cent. This is a slightly kaolinised felspar suitable for use in the pottery and enamel trades. It is intended to send specimens of the felspar to the British Empire Exhibition.

Engineers' Tour of St. Austell China Clay District

In connection with the meeting of the South-Western District of the Institution of Municipal and County Engineers at St. Austell on May 26th, the members were entertained to a luncheon by Mr. T. H. Williams (chairman of the Urban Council) after their business meeting, Mr. T. Medland Stocker, J.P., Joint Managing Director of English China Clays, Ltd., and Mr. J. W. Higman, Joint Managing Director of Associated China Clays, Ltd., being among the guests.

Mr. E. H. Collcutt, Cornwall County Surveyor, submitted the toast of "English China Clays, Ltd.," and r marked that he was supposed to look upon the China Clay producers as his sworn enemies on account of the wear-and-tear of the roads.

Mr. T. Medland Stocker, responding, hoped they would have an interesting afternoon touring the clay works, the arrangements having been made by Mr. H. E. Riley. He recalled that in the early days all the China Clay was despatched to ports and stations by road, the ruts made in some roads being 2 ft. deep.

Mr. James Perry (vice-chairman of the Urban Council) a prominent China Clay producer, submitted "The Institution," and remarked that though St. Austell was not exactly the hub of the universe, it was the centre of a most important industry.

The party afterwards entered motor chars-à-bancs, and were escorted through the heart of the China Clay district, taking the route through Trewoon, St. Stephens, Churchtown, Treviscoe, St. Dennis, to Hendra China Clay Works, where English China Clays, Ltd., produce the best potting clays used in the manufacture of china and hard porcelain. There they were received by "Capt." Yelland, who, with Mr. Medland Stocker and Mr. Riley, showed the visitors over. In the power station the suction gas plant was much admired. At the pit they were shown high-pressure hydraulic hose at work breaking and washing clay, were taken over the incline and inspected the micas, settling pits, filter presses, and drying kilns. The party then set off for the company's china-stone grinding mills at Pont's Mill, *via* Whitemoor and Roche, where a brief halt was made to view Roche Rocks, the ruins of an ancient hermitage. The route afterwards taken was through Bugle, Penwithick, Mount Charles, Holmbush and St. Blazey to Pont's Mill, where tea in the open awaited the visitors and was excellently catered by Mrs. Gaved. Here English China Clays, Ltd., were responsible for the hospitality under the supervision of Mr. Riley as guide.

At the close of luncheon, Mr. D. Edwards voiced the thanks of the visitors to English China Clays, Ltd., and to their genial escort, Mr. Riley. He described the outing as the best meeting the District had ever had.—Responding, Mr. Riley mentioned that the ground china stone they were about to see was used for the glazing of china and enamel ware and for artificial teeth. A visit was then paid to the china-stone grinding mills where the turbines were seen at work.

The tour of the district was mapped out jointly by Mr. Groves, Mr. Riley, and Mr. A. J. Bright (St. Austell Rural Council Surveyor), and the programme was so admirably kept that everything was carried out as arranged.

Shipping and Export News of the Month

We give below the latest particulars relating to arrivals and sailings of ships engaged in the China Clay Trade, at the principal British clay ports. Registered exports of China Clay with countries of destination, and other shipping and export matters are dealt with.

Fowey Shipping—May, 1923

Arrived.		Vessel's Name.	Sailed.	
May 1,	S.V.	*Helena Anna*	May 22,	Leith
May 1,	S.S.	*Aigburth*	May 10,	Brussels
May 2,	S.V.	*Jade*	May 14,	Hamburg
May 2,	S.S.	*Wearsider*	May 7,	Rouen
May 3,	S.S.	*Farfield*	May 4,	Liverpool
May 3,	S.S.	*Tarnwater*	May 9,	Liverpool
May 3.	S.S.	*Ravenspoint*	May 11,	Genoa
May 3,	S.S.	*Audax*	May 10,	Antwerp
May 3,	S.V.	*Emily Warvrick*	May 21,	Runcorn
May 3,	S.V.	*Hebe*	May 4,	Antwerp
May 3,	S.S.	*B.W. III*	May 9,	Antwerp
May 4,	S.S.	*Marnix*	May 11,	Bilbao
May 4,	S.V.	*Punctum*	May 19,	Fredrickshald
May 5,	S.S.	*Mersey*	May 10,	Grimsby
May 5,	S.S.	*Sturdee Rose*	May 11,	Weston Point
May 5,	S.S.	*Tanny*	May 8,	Newport,Mon.
May 7,	S.S.	*Elswick House*	May 17,	Philadelphia
May 7,	S.S.	*Seaforth*	May 12,	Ridham
May 7,	S.S.	*Hartfield*	May 24,	Baltimore
May 8,	S.V.	*Yvonne*	May 12,	Antwerp
May 8,	S.S.	*Sojourner*	May 11,	Rouen
May 8,	S.S.	*Cambalu*	May 12,	Liverpool
May 9,	S.V.	*Mary Barrow*	May 26,	Rochester
May 9,	S.S.	*Ratipiko*	May 12,	Gravesend
May 9,	S.S.	*Haarfagre*	May 15,	Antwerp
May 9,	S.S.	*Aalkmaar*	May 12,	S-odertelje
May 10,	S.S.	*Isabella*	May 15,	Antwerp
May 10,	M.V.	*Eyfjord*	May 16,	Leith
May 11,	M.V.	*Scania*	May 18,	Trongsund
May 12,	S.S.	*Brier Rose*	May 15,	Preston
May 12,	S.S.	*Berkelstroom*	May 18,	Amsterdam
May 14,	S.S.	*Duex Frères*	May 18,	Rouen
May 14,	S.S.	*Innisholm*	May 14,	Newlyn
May 14,	S.S.	*Pansy*	May 17,	Preston
May 16,	S.S.	*Moss Rose*	May 17,	Runcorn
May 16,	S.S.	*Ivytown*	May 18,	Weston Point
May 17,	S.S.	*Watsness*	May 26,	Boston, Mass.
May 17,	S.S.	*Ascania*	May 23,	Brussels
May 18,	S.V.	*Pursuit*	June 4,	Goole
May 18,	S.S.	*Dempster*	May 23,	Rouen
May 18,	M.V.	*Ostfjeld*	May 24,	Sarpsborg
May 18,	S.S.	*Seaforth*	May 19,	Cork
May 19,	M.V.	*Rognlund*	May 24,	Sandviken
May 19,	S.S.	*Blush Rose*	May 24,	Preston
May 19,	S.S.	*Edern*	May 24,	Aberdeen
May 19,	S.S.	*Primrose*	May 24,	Weston Point
May 21,	S.S.	*Trader*	May 26,	Rouen
May 21,	S.S.	*Madras City*	June 1,	Portland, Me.
May 21,	M.V.	*Hetty*	May 24,	Newport,Mon.
May 23,	S.S.	*Overton*	May 26,	Ridham
May 23,	S.S.	*Mersey*	May 26,	Hull
May 25,	S.S.	*Alberta*	May 28,	Brussels
May 25,	M.V.	*Margot*	May 29,	Stockholm
May 25,	S.V.	*Edward*	June 2,	Runcorn
May 25,	S.S.	*Avance*	May 29,	Hamburg
May 25,	S.V.	*Prima*	June 4,	Helsingfors
May 25,	S.V.	*Amy*	June 8,	Charlestown
May 25,	S.V.	*Frances and Jane*		*
May 26,	S.S.	*T. P. Tilling*	May 29,	Runcorn
May 26,	S.S.	*Marnix*	June 5,	Pasages
May 26,	S.S.	*Isabella*	May 30,	Nantes
May 26,	S.V.	*Pet*	May 28,	Par
May 26,	M.V.	*Thames*		*
May 28,	S.S.	*Elsa*	June 1,	Drammen
May 28,	S.V.	*Roma*		*
May 29,	M.V.	*Mary Peers*	June 7,	Gravesend
May 29,	S.S.	*Pansy*	May 30,	Ridham
May 30,	S.S.	*Brier Rose*	May 30,	Larne
May 30,	S.S.	*Freighter*	May 31,	Sunderland
May 30,	S.V.	*Rhoda Mary*		*
May 30,	S.S.	*Guelder Rose*	June 5,	Preston
May 31,	S.V.	*Elaine*	June 7,	Nantes

* In port.

Par Harbour Shipping—May, 1923

Arrivals

Date.		Vessel's Name.	From.
May 2.	S.S.	*Trader*	Hayle
May 2.	S.S.	*Rossgarragh*	Penryn
May 2.	S.V.	*Valkyrie*	Lannion
May 4.	S.V.	*Saint Austell*	Bristol
May 12.	M.V.	*Haldon*	Port Houstock.
May 13.	S.S.	*Magrix*	Teignmouth.
May 16.	S.S.	*City of York*	Fowey
May 17.	S.V.	*Hero*	Falmouth
May 18.	S.S.	*Norrix*	Hull
May 18.	S.S.	*City of York*	Charlestown
May 21.	S.S.	*Svea*	Coursielles
May 23.	S.S.	*City of York*	Charlestown
May 24.		*The Sirdir*	Plymouth
May 25.	S.V.	*Lilla*	—
May 28.	S.S.	*Alison*	Barry
May 28.	S.V.	*Pet*	London
May 29.	S.V.	*Devonia*	Goole
May 29.	M.V.	*Olive May*	Wisbech
May 29.	S.S.	*Robrix*	Hull
May 29.	M.V.	*Garlandstone*	Bristol
May 30.	S.V.	*Duchess*	Runcorn
May 31.	S.V.	*Flying Foam*	Dartmouth

Sailings

Date.		Vessel's Name.	Destination.
May 1.	S.S.	*Iron Duke*	Penarth
May 2.	M.V.	*Isabel*	Pentewan
May 3.	M.V.	*Garlandstone*	Gloucester
May 3.	S.V.	*Confinance*	Nantes
May 4.	M.V.	*Katie*	Manchester
May 5.	S.S.	*Trader*	Aberdeen
May 5.	S.S.	*Rossgarragh*	Garston
May 5.	M.V.	*Schwan*	Kirkaldy
May 9.	S.V.	*Saint Austell*	Port Houstock
May 14.	S.V.	*Snowflake*	Runcorn
May 14.	S.V.	*Pet*	London
May 14.	S.V.	*Two Sisters*	Antwerp
May 14.	S.V.	*Guarding Star*	Runcorn
May 15.	S.V.	*Valkyrie*	Kirkaldy
May 16.	S.S.	*City of York*	Plymouth
May 18.	M.V.	*Haldon*	Penarth
May 22.	S.S.	*Norrix*	Gravesend
May 23.	S.S.	*City of York*	Plymouth
May 28.	S.V.	*Hero*	Liverpool
May 28.	S.S.	*Svea*	Kirkaldy
May 28.		*The Sirdir*	Pentewan
May 29.	S.S.	*Alison*	Roscoe
May 30.	S.S.	*Robrix*	Truro

Charlestown Shipping—May, 1923

Sailings

Date.	Vessel's Name.	Destination.
May 2.	*Hebe*	Antwerp
May 4.	*Alberta*	Antwerp
May 4.	*Fox*	Brussels
May 9.	*Lady Daphne*	Rochester
May 9.	*Cetus*	London
May 12.	*Lady Helen*	London
May 14.	*Mary Watkinson*	London
May 15.	*Christiana*	Barrow
May 17.	*Coniston*	Preston
May 16.	*Falmouth Castle*	Manchester
May 19.	*Weser*	Rochester
May 19.	*Madeleine*	Nantes
May 22.	*Lord Haig*	Rochester
May 28.	*Water Witch*	Preston
May 29.	*C. L. Rasmussen*	Gotenburg
May 29.	*T. W. Stuart*	London
May 30.	*Falmouth Castle*	Runcorn
May 31.	*Christiana*	Preston

Par Harbour Tide Table, June, 1923

(British Summer Time throughout.)

Day of Week.	Day of Month.	Morning.	Afternoon.	Height.
Friday	1	7.39	8.1	13·7
Saturday	2	8.23	8.45	13·1
SUNDAY	3	9.7	9.26	12·4
Monday	4	9.50	10.12	11·7
Tuesday	5	10.35	11.0	10·10
Wednesday	6	11.26	11.54	10·3
Thursday	7	—	0.24	9·11
Friday	8	0.57	1.32	9·11
Saturday	9	2.6	2.38	10·3
SUNDAY	10	3.8	3.36	10·9
Monday	11	4.2	4.27	11·3
Tuesday	12	4.50	5.11	11·8
Wednesday	13	5.32	5.52	12·0
Thursday	14	6.11	6.31	12·2
Friday	15	6.50	7.8	12·3
Saturday	16	7.27	7.45	12·4
SUNDAY	17	8.4	8.22	12·3
Monday	18	8.41	9.1	12·1
Tuesday	19	9.21	9.42	11·9
Wednesday	20	10.4	10.27	11·5
Thursday	21	10.52	11.19	11·0
Friday	22	11.48	—	10·9
Saturday	23	0.20	0.55	10·10
SUNDAY	24	1.31	2.8	11·3
Monday	25	2.43	3.16	11·10
Tuesday	26	3.47	4.17	12·6
Wednesday	27	4.47	5.17	13·0
Thursday	28	5.46	6.13	13·2
Friday	29	6.39	7.4	13·3
Saturday	30	7.27	7.49	13·3

H. L. VICARY, Harbour Master.

China Clay Exports

RETURN showing the exports of China Clay (including Cornish or China Stone), the produce or manufacture of the United Kingdom, from the United Kingdom to each country of destination registered during the month ended May 31, 1923:—

Country of Destination.	Quantity. tons.	Value. £
Finland	451	750
Sweden	3,901	9,216
Norway	1,944	3,148
Denmark	5	16
Germany	884	2,579
Netherlands	1,221	3,166
Belgium	7,535	15,719
France	3,184	6,920
Switzerland	117	210
Portugal	22	111
Spain	56	208
Italy	1,589	4,566
United States of America	26,316	65,132
Mexico	40	80
Brazil	10	40
Argentine Republic	50	190
Nigeria	—	1
Bombay via Other Ports	1,599	5,815
Madras	10	40
Bengal	200	880
Victoria	13	58
New South Wales	19	225
Queensland	2	14
Canada	300	1,113
Irish Free State	5	9
Total	49,473	120,206

May China Clay Deliveries

Biggest Monthly Record since 1914

RECORDS continue to be made by the revival in the China Clay industry which commenced early in 1922 and has continued ever since with varying degrees of increase. The highest monthly aggregate of deliveries has now been reached, the figures for May having reached the magnificent total of 85,909 tons. The total for the five months is 352,010 tons, against 266,101 tons for the corresponding five months last year, an excess in favour of this year of 85,909 tons. As an indication of how well the China Clay trade has recovered from the slump period, the figures for the five months this year exceed the total of the whole year of 1921. The monthly total shipped from Fowey before the War was 70,000 tons; in May the port nearly reached it with a tonnage of 69,246. Not since 1914 has such a big quantity of clay been dispatched in a single month. This result has given a great impetus to employment in the Cornwall and Devon China Clay areas where there is now very little employable labour that is not absorbed. America continues to be a big market, but there is also a strong home demand, an index to which is the large quantity sent by rail throughout, despite the fact that sea freights are very much less costly. The details of deliveries for May are :—

Port.	Tons.
Fowey	69,206
Charlestown	5,062
Par	3,600
St. Blazey	963
Plymouth	779
Falmouth	25
By rail	5,139
Total	84,774

Against 63,162 tons, May 1922.

China Clay Arrivals at Antwerp

PARTICULARS of arrivals of China Clay in the port of Antwerp during the month of May :—

From.	Vessel's Name.		Date.	Tons.
Teignmouth	M.S.	*Record Reign*	May 3	270
Fowey	S.S.	*Spinner*	May 4	600
Fremington	S.S.	*Ortona*	May 4	580
Charlestown	S.S.	*Alberta*	May 7	383
Fowey	S.S.	*B.W. 3*	May 11	476
Fowey	S.S.	*Audax*	May 12	565
Poole	Barge	*Tintara*	May 15	121
Plymouth	Sloop	*Mystery*	May 16	183
Teignmouth	M.S.	*Young Fox*	May 16	162½
Fowey	S.S.	*Isabella*	May 17	375
Par	S.V.	*Two Sisters*	May 19	211½
Par	S.S.	*Magrix*	May 19	305
Poole	Ketch	*Justice*	May 20	150
Poole	Sloop	*Britannic*	May 24	250
Fremington	Sloop	*Lord Lansdowne*	May 27	252

Commercial Intelligence

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

BRADES BLUE BRICKS, LTD., Oldbury. £26 13s. 6d. April 10.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

CENTRAL CORNWALL CHINA CLAY CO., LTD., St. Blazey. Registered May 7, £1,500 debentures part of £25,000; general charge.

LION BRICK AND TILE CO., LTD. (late MELBODEL SYNDICATE, LTD.), London, E.C. Registered June 5, £4,000 debentures; general charge. *——. January 13, 1923.

MARSHALL (J. W.) AND CO., LTD., Bolton, paper manufacturers. Registered May 23, £6,000 debentures; general charge. *£1,000. March 11, 1922.

STANDARDISED CHINA CLAY CO., LTD., London, E.C. Registered April 18, £350 debentures, and June 1, £2,500 debentures, part of £30,000; general charge. *£9,223. December 31, 1921.

INDEX TO ADVERTISERS

FOR CLASSIFIED INDEX TO TRADES SEE PAGES xxx & xxxi

INDEX TO ADVERTISERS—*Continued*

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THERE is no fire too fierce for Foamite Firefoam. It will instantly extinguish the flames, even on burning spirit, by smothering them with a blanket of foam that deprives them of oxygen. It is the greatest and most epoch-making discovery in the science of fire fighting, and so certain in its effects that valuable insurance concessions are granted to those who use it.

Foamite Firefoam appliances are made in a variety of sizes from 1 gallon hand extinguishers to 34 gallon portable engines. It is adapted for use in sprinkler installations for ships, factories, offices and government buildings, and is already installed on the foremost liners and in the works and office of many famous organisations.

WHAT FOAMITE FIREFOAM DOES

Foamite Firefoam does a great deal more than any other fire extinguisher, it rapidly and effectively extinguishes fire, fireproofs everything it touches, prevents re-ignition, is entirely unaffected by draughts and wind, clings to any surface at any angle, floats on liquids and does not denature or damage in the least any fabric, substance or material it comes in contact with.

WHAT FOAMITE FIREFOAM IS

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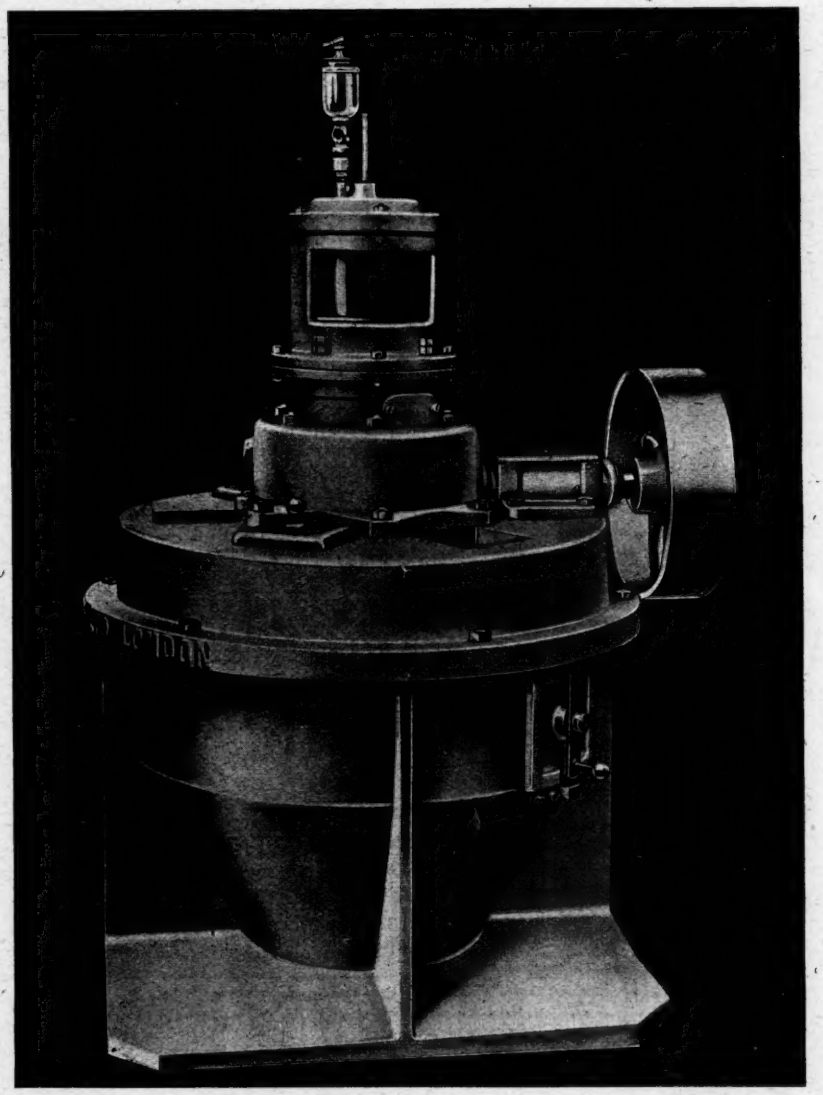

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The Chemical Age

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TRADE GUIDE

The Chemical Age

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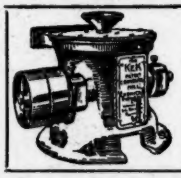

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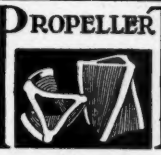

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